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EDITORIALS

MAGNETIC PROPERTIES OF PURE IRON.

In the issue of October 30, 1915, we called attention to the remarkable magnetic properties found by Prof. T. D. Yensen in electrolytic iron which had been fused in a vacuum and also in the alloys made from this material. Low hysteresis accompanied by a maximum permeability exceeding 20,000 was found in the pure iron after annealing in a vacuum, while even more remarkable values were obtained from certain silicon alloys. Melting the material in a vacuum affords an opportunity to rid the iron of occluded gases, such as hydrogen, which is known to be present in electrolytic iron in considerable quantities.

Similar experiments have now been carried out by Professor Yensen upon specimens of open-hearth iron, said to have a purity initially of 99.84 per cent. This material also, after melting in a vacuum and annealing, shows magnetic properties much superior to ordinary iron and to the same specimen before remelting, the hysteresis being lowered and the permeability greatly increased. Nearly as good results are obtained with this material as with the electrolytic iron, the permeability in one case going above 20,000, while the hysteresis at a flux-density of 10,000 gausses is not much greater than for the electrolytic iron. At a flux-density of 15,000 gausses, the hysteresis is no larger than for electrolytic iron and the permeability greatly improved, being about five times as large as for the electrolytic iron. The specific resistance of the open-hearth iron is approximately the same as for electrolytic iron.

These experiments indicate that there may be a field for the industrial application of melting in a vacuum iron which is to be used for magnetic purposes, such as in the cores of electric generators, motors and transformers. While the melting of large quantities of material in a vacuum offers considerable mechanical difficulties, the use of open-hearth material in place of that electrolytically deposited for the purpose will considerably simplify the combined operation, with a corresponding effect upon costs. Since the pure iron from different sources acts in very much the same manner, it may be anticipated that the alloys made from this material will not show important differences. It is these alloys which are likely to be of greatest importance in commercial applications. If silicon-steels can be commercially produced in sheets with the properties found by Prof. Yensen in his best specimens, the design of electrical machinery will be literally revolutionized.

SKIN EFFECT IN STEEL RAILS.

Ever since alternating current was first used in electric railway systems utilizing the rails for a return circuit, the question of skin effect in the steel rails has been one of vital interest, since it influences the amount of power wasted in this part of the circuit and also the voltage drop in the grounded rails. The latter in turn has an important bearing upon the problem of electrolysis of underground metallic structures in the vicinity of the railway. In the case of third-rail systems the effect comes into the feed circuit as well as the rail return. Attempts have been made to measure this effect, but with only a partial degree of satisfaction, and the shape of a rail is such that the computation of the effect to be expected is not sufficiently simple to invite confidence in the results unless they have been verified by experimental investigations.

One of the most important investigations which has been made along this line was recently carried out at the Massachusetts Institute of Technology and is reported by Messrs. Kennelly, Achard and Dana in the August issue of *The Journal of the Franklin Institute.* This research involved both theoretical and experimental investigations, the practical measurements being made by two methods in order to give a reliable check upon the results. Contact rails as well as track rails were investigated and on account of being softer and having higher permeability the effect was much more marked in the contact rails. The ratio of the resistance with alternating current to the resistance with continuous current was found to be as high as 22 in contact rails and 15 in track rails at 60 cycles; while at 25 cycles the maximum ratio was over 13 for contact rails and over 10 for track rails. This ratio was found to gradually rise to a maximum with increasing current and then slowly decline. The current at which this ratio was a maximum was smaller in the soft contact rails and was in the neighborhood of 200 amperes, while for track rails it was from 400 to 800 amperes.

The maximum resistance ratio was found to vary substantially as the square root of the impressed frequency in the range between 25 and 60 cycles per second. The effective depth of penetration of current at 25 cycles was of the order of one millimeter. It was found that results obtained by measurement could be approximately predetermined by computation when the conductivity and the permeability curve of the material were known, except for a correction-factor which may be attributed to the shape of the rail, and

which is determined by these experiments. It is also shown that it is useless to increase the conductivity of the rail if at the same time the magnetic permeability is increased in the same or in a greater ratio.

This research will be of great value in assisting to a more exact predetermination of the conditions existing in both track and contact rails in alternating-current railway systems. The authors conclude that the best form of rail for current-carrying capacity is one in which the effective perimeter has a maximum and the worst form is a cylinder. For a contact rail, where mechanical strength is of less importance, a hollow flattened cylinder is recommended.

THE SERVICE OF THE ENGINEER.

The fundamental idea at the basis of every profession is service. The recognition of the idea of service and duty to others gives rise to the ethics of the profession. Remuneration for service rendered is of course expected, but to the truly professional man the remuneration is incidental and the service fundamental. In this viewpoint he differs essentially from the quack and from the man who merely commercializes professional service. The latter loves not his work, but carries it through merely for the sake of the reward which it brings.

The engineer, as a rule, is a professional man. He desires to accomplish for the sake of the accomplishment—the service of others or of humanity in general. He likes to see things done right—the best possible use made of the available resources—and this constitutes efficiency. Among all occupations there is none which is more capable of rendering service to mankind and of realizing the high ideals which go with service than engineering. Whether considered from the broadest plane of humanitarianism and international brotherhood or the narrower plane of patriotism and the service of his own countrymen, the engineer has an immense field for his activities. The conservation of natural resources is a movement offering one example on a large scale of what the engineer may do in an altruistic way, and engineers have largely initiated this movement, and upon them must real accomplishments in this direction depend.

The efforts of many engineers, however, have been exerted along rather narrow lines, and a wholesome element would be added to many public movements if the engineer took a broader interest in civic and social matters and actively participated in their formulation and execution. His broad experience in measuring, analyzing and planning, and his ability to visualize, idealize and devise, should be even a greater asset to mankind than it is, and accelerate the attainment of a state of comfort and convenience for all through better means of production, transportation and utilization. His development of public utilities has greatly improved living conditions, especially in cities, but in the larger fields of city planning and civic betterment there is much awaiting his efforts.

ELECTRICAL SUPPLY CONDITIONS IN PARIS.

We have several times called attention to the effect which the European war has had upon the conditions of operation of the central stations in England, chief among which are the price of coal, the scarcity of labor and the change in the character and amount of load. The annual report of a company which operates the central station in the capital of France affords an opportunity to review the situation in that city.

The company which operates the central station in Paris was formed by the consolidation of smaller companies holding franchises for limited sections of the city. The consolidated company was given a franchise which guaranteed a monopoly of the business until 1940, at which time the property is to be turned over to the municipality without any payment upon the part of the latter. In the meantime the city is to receive a percentage of the revenues and also a share in the annual profits in excess of six per cent of the invested capital, as represented by the outstanding stock. This stock amounts to approximately $20,000,000, while an equal portion of the capital exists in the form of bonded indebtedness. There is a provision that the company should each year liquidate from revenues a certain portion of the original investment, so that the securities would be entirely retired by the time the franchise expired.

In 1910 the total consumption amounted to 87,369,000 kilowatt-hours, which represented an increase of 100 per cent in less than four years. Owing to the outbreak of war the consumption decreased in 1914 to 54,157,000 kilowatt-hours, and in 1915 it decreased still further to 38,579,000 kilowatt-hours. This was less than half the annual output before the war, which in itself seems small to the American manager who is accustomed to equal outputs in cities of one-tenth the population of the French capital.

Coincident with the declining load during the war period came an increase in operating expenses due to the scarcity and inefficiency of labor and the high price of coal and other materials. Coal is secured almost entirely from England. Before the war the cost was approximately $4.70 per ton. In 1915, in virtue of an existing contract, the price per ton was about $8.25, but during the present year it has been necessary to pay over $23 per ton.

In view of the contract existing between the company and the city, the former has asked the latter for a concession in the way of compensation, especially as the rates were reduced in 1914 shortly before the beginning of the war. In view of the intention to amortize the cost out of revenue within a limited period, this seems only equitable, as the dividend in 1915 amounted to only four per cent, and the likelihood is that there will be none at all in 1916. We understand that the arrangement between the city and the company precludes seeking relief through the raising of rates unless the municipality should give its consent to the increase.

ALLOWANCE FOR DEPRECIATION RESERVE.

In the final arguments of the now celebrated Bay State Street Railway fare case before the Massachusetts Public Service Commission, a highly suggestive discussion of allowance for depreciation reserve was presented by the company, with comment of more than local interest as to the principles involved in this instance. Public-utility managers recognize and courts and commissions generally appreciate the necessity for providing an adequate allowance for depreciation, and so far as is known no court or commission has even suggested that the annual allowance for this purpose should be less than the amount necessary to keep the reserve large enough to maintain the total value equal to the original cost. While it is true that the physical property of a company need not and cannot be in 100-per-cent age condition without having an actual reserve, an attempt to compute a reserve which would only keep a property up to normal operating condition would be most unreasonable to the investor, since it would not keep his investment intact.

The annual depreciation allowance, in the first place, should be enough so that uncertainties are avoided, and an attempt to reckon it on uncertain and shifting conditions dependent on rate of growth and many other unknown factors is too dangerous a method to be applied. Further, in case of purchase or sale of the property, it is by no means certain that the investor would be protected by any such method. A public utility should be allowed to keep its investment intact. The fact that all companies have not done so in the past has no bearing on the question. Many new companies, like the Bay State, through force of circumstances or through belief that a low rate would ultimately develop the business faster than a higher rate, have hoped that the larger business of later years would make up for the inadequacy; but this was not an attempt to forego the accumulation of a reserve for all time, but merely to postpone it.

As to the proper method of computing the reserve, the straight-line plan is the most common. This might, as the company showed, in the case of a new property, accumulate more than the depreciation requirements, as the fund would be earning while the property was in place. Mr. R. M. Feustel, of the company's consulting staff, stated that he believed with a new property depreciation should be computed on a sinking-fund basis, but that in the Bay State case the annual charges were constant, due to the fact that the investors had already made sacrifices to the amount of the accrued depreciation.

In view of the fact that many other commissions allow the accumulation of the depreciation fund on a straight-line basis and even on the reproduction instead of the original cost of the property, and the fact that the lives assumed by Mr. Feustel are longer than those assumed in other cases, and his estimates of future needs correspondingly low, it was contended that it would be fair to allow the company the comparatively small amount of difference between the estimates necessary on a sinking-fund and a straight-line basis. This course, it was maintained, does not prejudice, but helps, the riding public, as it gives an opportunity to provide a better service, and if it ever proves that the depreciation fund is accumulating too rapidly, a downward adjustment of rates is easily brought about. In passing, it may be noted that in the Feustel valuation, the annual depreciation on this great property of nearly 1,000 miles of single track was determined on the straight-line basis to be 4.41 per cent, the composite life of the depreciable property being 22.7 years. This estimate gave the composite life of the entire property as 29.26 years and the annual depreciation requirements on the total investment as 3.4 per cent.

It may be held fairly that if the annual depreciation allowance is not to be computed on a straight-line basis, in view of the situation on this property and the uncertainties of the future, the interest charged to the sinking fund should be reckoned at a low rate. The probable full discussion of the depreciation problem by the commission in its forthcoming decision in this important case is anticipated with interest by engineers concerned with valuation and rate-making problems.

An interesting discussion of accrued depreciation was given by the Maryland Public Service Commission after investigating the rates of the Chesapeake and Potomac Telephone Company and finding that the earnings under the present rates are not excessive. Considerable discussion was given in the opinion as to whether the amount deducted from the reproduction cost should represent the actual physical deterioration of the property, or should include the "additional functional deterioration which practically all property undergoes with the lapse of time, but which in large part may be said to be latent at any particular time." The estimate of 20 per cent finally adopted was taken to represent the present depreciation including inadequacy or obsolescence with lapse of time and it was held that the company was entitled to earn a return on 80 per cent of the reproduction cost new.

The opinion points out the need for establishing a depreciation reserve, and where this has been properly done would make no deduction for depreciation. In the present case the Commission aims to build up gradually a depreciation reserve of 20 per cent, which may be invested in new equipment, and says that with such additions to the physical property, the company shall be at all times entitled to a return upon 80 per cent of reproduction cost new. It is thus evident that, even without the supply of any additional capital, the amount upon which a return is allowed should gradually be brought up to equal the original investment. This appears to be a method of limiting returns to a basis of present value of the property, while at the same time encouraging further investment and insuring that the stockholders shall eventually receive justice and own a property whose value is fully equal to the invested capital.

Happenings in the Industry

Sanitary District of Chicago Secures Power Site at Joliet—Program of Pennsylvania Convention—New Transmission Line for Massachusetts—Northern Illinois Utilities Consolidate—Plans for America's Electrical Week — New Street Lighting at Princeton—Additional Papers for Illuminating Engineering Convention—Miscellaneous News Notes.

Lease of Water-Power Site at Joliet Secured by Sanitary District of Chicago.

The Sanitary District of Chicago was awarded the lease of the water-power rights at dam No. 1 in Joliet, Ill., at a hearing held last week and attended by President Sherman L. Marshall of the Illinois and Michigan Canal Commission, Chairman William L. O'Connell of the Illinois Public Utilities Commission and other officials. Two bids, known as alternatives "A" and "B," were offered by the Sanitary District, and a third bid was presented by Andrew J. Cook, who, it is understood, represented the Public Service Company of Northern Illinois. The latter bid was for $3 per horsepower per year, while the Sanitary District offered the state $15.01 per horsepower per year or the alternative of constructing for the state $1,500,000 worth of locks and other waterway improvements within a period of two years.

The Economy Light & Power Company, now a subsidiary of the Public Service Company of Northern Illinois, has controlled the waterpower site for 60 years, the Illinois and Michigan Canal Commission having granted a 20-year lease with the privilege of two 20-year renewals, the last of which expired during the middle of July. The company paid the state approximately $9,500 yearly for these rights. It is reported that Mr. Cook's bid, made presumably for the Public Service Company of Northern Illinois, was low because the company can generate energy at its new steam power plant now in course of construction at Joliet nearly as economically as it could in a water-power plant. Then, too, the location of the plant in the center of the city offers numerous difficulties in high-tension line construction and operation.

The Sanitary District's bid, known as alternative "A," was accepted, and under its terms the district will proceed with the development of the site, it being stipulated that machinery capable of delivering 7,000 horsepower be installed, and that the state receive $15.01 per horsepower per year for all power developed. Plans are now being made by the Sanitary District for the installation of a modern power plant at Joliet at an estimated cost of $500,000. Energy will be generated at 6,600 volts, and will be transmitted to Lockport at that voltage where it will be stepped up to 44,000 volts for transmission to Chicago. Another tower line probably will be constructed from Lockport to Chicago to carry circuits for the transmission of the additional energy that will be secured upon the completion of the new plant.

Program of Pennsylvania Electric Association Convention.

The ninth annual convention of the Pennsylvania Electric Association will be held September 6-8 at the Forest Inn, Eagles Mere Park, Pa. The officers and committees have united their efforts and a very successful meeting is anticipated.

Besides reports by committees on rates, engineering, accounting, safety and welfare, geographic sections, and municipal street lighting, the following papers will be presented: "Construction Records and Accounts," by H. C. Hobson, Wilkesbarre; "Construction Costs," by F. Heinbokel, Warren; "Store-Room and Tool Records," by W. P. McArdle, Pittsburgh; Method of Securing Consumers Deterred by First Cost of Wiring," by E. C. Newman, Connellsville; "Increased Use of Electric Ranges and Small Appliances in the Home," by H. W. Reed, Altoona; "Testing of Current and Potential Transformers," by W. A. Fogler, Philadelphia; "Boiler-Room Operations," by H. H. Wilson, Harrisburg; "Classification of Men, Wages and Methods in Central-Station Industry," by J. F. Martin and H. N. Müller, Pittsburgh, and "Cost and Factors in Underground Construction," by W. H. Keating and H. N. Müller, Pittsburgh.

H. M. Stine, 211 Locust Street, Harrisburg, is secretary of the Association.

Value of Property Not Affected by Pole Lines.

The Supreme Court of New York state has rendered an important decision regarding the status of pole lines as pertains to the marketable value of adjoining property, holding that the installation of such lines does not affect the value of the premises. The action was brought to reform contracts made by parties for the purchase of property in the Bronx section of New York City, owing to the presence of poles and wires on the sidewalk in front of the property. The owners of the property (defendants) entered a counterclaim for the specific performance of the contract, claiming that the value of the property was not decreased by reason of the poles and overhead lines.

In its decision the court says that the presence of the various poles and wires on the sidewalk does not furnish any ground for the rejection of the title of the property, nor make such title unmarketable, as claimed by the plaintiffs. In concluding, the court remarks: "The poles and wires are not such incumbrances as would decrease the value of the premises, and the imperfections in title, if any, caused by their presence is so slight that the parties did not have them in contemplation at the time of the making of the contract, or if they did have them in contemplation they would have disregarded them."

Transmission Line Projected in Massachusetts.

The New England Power Company proposes to construct a 66,000-volt transmission line about 10.5 miles long, between Palmer and Ware, Mass., to serve territory in Connecticut that now takes about 2,000 kilowatts, but which the company expects to increase to 5,000 kilowatts within the next two years. It is proposed to construct a pole line temporarily, owing to the high cost of materials, and later to substitute a steel-tower line. A substation would be built at Palmer.

At present the company has a 66,000-volt power line connecting with plants on the Deerfield River and at Vernon on the Connecticut River, through Ware to Millbury. It has also a line of the same capacity from Palmer south into Connecticut. There is a gap between Palmer and Ware, but temporarily current is transmitted over a local 22,000-volt line of the Central Massachusetts Electric Company; this line is now overloaded and is on the public highway.

At a public hearing July 25, at Palmer, Mass., representatives of the company said the Connecticut territory had been investigated and that it is believed there is a possible load there of 20,000 kilowatts. It is proposed to build the tower line, ultimately constructed, of two 10,000-kilowatt circuits, and to connect with a high-tension line now under

construction in Rhode Island, which will probably be extended to New London, Conn.

Plans for the Ware-Palmer line contemplate a 100-foot right of way, 40-foot chestnut poles, suspended disk insulator, and seven-sixteenth-inch galvanized iron wire with about 5,000-kilowatt capacity. Right of way has been acquired for the whole distance except 400 feet which is held by three owners.

The hearing concerned itself principally with the question whether public interest requires the construction of the line. The fact that the owners asked prices higher than the company deemed reasonable was not at issue. The law provides that where a company has secured 75 per cent of the necessary street crossing authorization, the Commission may order that the line may be constructed.

In that event, the company may seize the land under right of eminent domain, and the landowners, if not satisfied with the terms, may have the damages ascertained by a jury.

The company's generally accepted price for location is $20 per tower and $5 per pole, which the Chairman of the Commission said he thought a fair price.

Commenting on the Board's general attitude toward the proposition, Chairman Weed said that a company should pay liberally for its takings. The reason the legislature passed the act which gives transmission and power companies a limited right of eminent domain was because it became almost impracticable to run lines across country without being held up by landowners whose demands made the cost of private locations excessive. "If the company had to pay the total cost at a very excessive figure," said the chairman, "the burden of carrying that necessarily fell upon the people who ultimately use the electricity." If companies paid excessive prices for easements, the Board would be inclined to decline to allow stock issues for such a purpose, he said.

Northern Illinois Utilities Consolidate.

A consolidation of electrical interests in the northern part of Illinois occurred last week, when the Freeport Railway & Light Company, the Illinois Northern Utility Company and the Tri-County Light & Power Company were merged into one concern, which will be known as the Illinois Northern Utilities Company.

Under the new arrangement electric service will be furnished to 63 towns in the northern part of the state and electric railway service will be furnished to about 40 of the 63 towns. Dixon, Ill., will be the center city of the towns and a new electric power house will be erected there at a cost of approximately half a million dollars.

E. D. Alexander, of Dixon, vice-president of the Illinois Northern Utilities Company, and C. B. Yonts, of Dixon, general contract agent, announced the arrangements for the consolidation. Mr. Alexander said the consolidation has been approved by the State Public Utilities Commission. No important changes are to be made, although the directorate of the Freeport Railway & Power Company will go out of existence. The consolidation of the three companies was made to effect a more flexible organization, according to Mr. Alexander, which can be handled to better advantage than if the companies operated singly.

Proposed Inspection Tour in Connection with the Illuminating Engineering Lecture Course.

The committee in charge of the inspection tour, which it is expected will be an outstanding feature of the lecture course to be given under the auspices of the Illuminating Engineering Society and the University of Pennsylvania, in September, has issued the following preliminary information.

The general purpose is to assesmble as many as may be interested in taking this trip and take them as a party to visit places of notable lighting interest. At each city there will be a local committee having charge of the entertainment of the visitors and seeing to it that they obtain as much as possible of value in the way of information and interest. The cities of Pittsburgh and Washington will be visited in advance of the convention. During the lecture course there will be a week-end side trip to Atlantic City. Subsequent to the lecture course the party will visit New York, Boston, Schenectady, Buffalo, Niagara Falls, Cleveland and Chicago.

Arrangements will be made so that those desiring to do so may join the party at any point and leave it whenever desired, provided only that each delegate must register for that part of the trip which he proposes to take in order that arrangements for taking care of him may be completed.

The following is the itinerary:

Pittsburgh	September 16
Washington	September 17
Philadelphia	September 18 to 23
Atlantic City	September 24
Philadelphia	September 25 to 28
New York	September 29 to October 1
Boston and Lynn	October 2
Schenectady	October 3
Buffalo and Niagara Falls	October 4
Cleveland	October 5
Chicago	October 6

America's Electrical Week Plans.

Building on past experiences the plans of the Society for Electrical Development have been perfected for America's Electrical Week, December 2 to 9, 1916. Even at this early date local committees have organized in 286 cities and these committees of representative electrical men have begun work to make the week this year surpass last yar's wonderful success. The immediate plans include the issuance of several "How to" booklets detailing the many things that can be done by individuals, committees, associations and electrical concerns to take advantage of the national campaign.

About August 19 an attractive booklet will be issued outlining the work that may be done by the industry in general and presenting the preliminary plan of action. The relationship between the various organizations will be shown and their various duties designated. Publicity campaigns that should prove effective in popularizing America's Electrical Week will be outlined. This "Facts" booklet will be distributed to 25,000 men interested in making this campaign a success. It is not intended for the exclusive use of electrical men, but will be of general interest.

The $1,000 prize winning poster will be reproduced on the cover of this book. This will be its first showing to the industry as the judges have only decided upon first choice in the National Poster Competition. As already announced, nearly 800 designs were submitted and the task of the judges was not an easy one to select a poster which would embody the thought of electric service. This poster will be the official design of the America's Electrical Week campaign. In will be reproduced millions of times on everything from a poster stamp to a bill board.

Committeemen in active charge of the various local plans will find the "Committeemen's Hand Book" of special interest and value. This will be the second book to be issued —probably about September 1. Ideal community celebration and sales campaigns for cities of 10,000 or less; 10,000 to 50,000 and 100,000 and more population have been analyzed and plans to fit the various conditions have been mapped out. The directions are given in detail and almost every condition has been thought of.

A concrete "cash in" booklet—the third of a series—follows the "Committeemen's Hand Book," but goes into

minute detail in outlining how the individual manufacturer, jobber, central station, contractor and dealer may participate with benefit.

Booklets will also be issued and mailed which will tell how to put on electric shows, electric sign and American flag campaigns, electric parades, etc. "How to" booklets of all descriptions will be free.

A valuable feature of the work of the society will be the publication of two papers to be known as the "Electrifier" and the "Exciter." The former will be especially helpful to local committeemen while the "Exciter" will give the latest news regarding America's Electrical Week to all the men in the industry. These publications will be newsy and full of interesting facts. The purpose is to be as helpful as possible in every way and to bring the work throughout the country before the attention of everyone interested.

As evidence of the general interest in America's Electrical Week it is worthy of note that four of the largest weekly magazines will issue special electrical numbers or sections on December 2. They are *Collier's, Scientific American, Scribner's* and *Leslie's*. The fields of these four large publications, with nearly 2,000,000 circulation, do not cross to any extent and there will be no direct conflict.

The Society for Electrical Development has increased its staff and is now said to have one of the best publicity and sales staffs in the country working to assist the industry in making America's Electrical Week bigger and better in every way than the memorable Electrical Prosperity Week of last year.

Low Street Light Poles to Avoid Trees.

The Public Service Company of New Jersey has installed eleven 400-candlepower nitrogen-filled lamps in magnetite-arc type lanterns on 10-foot iron poles on Nassau Street, Princeton, N. J., replacing seven 1,200-candlepower arc lamps. Undergrounding of all circuits in the heart of the town is now going forward.

The object sought in using poles of such low height is to allow the limbs of shade trees, particularly those bordering the University ground, to hang low and yet not obstruct the light.

It is found that the 10-foot poles are not objectionable

Ten-Foot Poles Installed in Princeton, N. J., on Streets Where Heavy Shade Trees Grow.

by shining in the eyes of vehicle operators. The same type of units are to be extended into various other streets of Princeton.

Western Light & Power Company To Make Extensive Improvements.

H. U. Wallace, general manager of the Western Light & Power Company, a Colorado concern, announces that his company will spend $200,000 in reconstruction and improvements before the end of the present year. The company supplies most of the electricity for lighting and power purposes that is used in the different cities and towns in Northern Colorado and Southern Wyoming. One of the improvements is to be the installation of automatic stokers at the company's steam plant in Lafayette, Colo.

Reports from the head office at Boulder, Colo., are to the effect that the concern has had a rapid growth of late due to the increased use of electricity for cooking, lighting and power purposes. The improvements that are to be made by the company will include the entire system in order that a high standard of service may be maintained.

Additional Papers for Convention of Illuminating Engineers.

In addition to the list of papers given in the issue of July 1, the following have been placed upon the program of the tenth annual convention of the Illuminating Engineering Society, to be held at Bellevue-Stratford Hotel, Philadelphia, September 18 to 20:

"Industrial Lighting by Gas," by J. D. Lee.

"Gas Illumination of the Philadelphia Civic Exposition," by C. S. Snyder and F. H. Gilpin.

"Experiments on the Eye With Pendent Reflectors of Different Densities," by C. E. Ferree and G. Rand.

"Studies of Economics in Office-Building Lighting," by S. G. Hibben.

"Recent Developments in Prismatic Glassware," by C. W. Roosa and H. L. Jenkins.

"Probability Curves as Applied to Photometric Measurements," by W. G. Housekeeper.

Power Line Authorized in Massachusetts.

The New England Power Company, Worcester, Mass., has been given authority by the Gas and Electric Light Commission to build a 66,000-volt transmission line, on private right of way, from its substation at Ware through West Brookfield to Palmer, there to connect with a line already built, running south to supply electricity to the Rockville-Willimantic Lighting Company at the state line, and to Stafford Springs, Conn. A new transformer station will probably be built at Palmer.

The line will be 10.35 miles in length, constructed of 40 to 45-foot poles with suspension disk insulators, on a 100-foot clearing. Approximate estimated costs are:

Superintendence, surveys, etc.	$ 3,500
Poles, erected	14,000
Cross-arms, equipment, etc.	6,000
Conductor, erected	7,200
Special crossing	3,200
Total	$33,800

New Light and Power Rates for Muskogee.

A sweeping reduction in light and power rates has been presented to the city authorities of Muskogee, Okla., and the State Corporation Commission of Oklahoma for approval. The feature is the provision cutting in two the present one-dollar minimum rate. Instead of the present 11-cent rate for light users, the new schedule fixes the cost at ten cents for the first 50 kilowatts per month, eight for the next 50, and seven for the next 50. From that figure the rate will scale down to two cents for 6,500 kilowatts per month or more. The small power user, who uses, say, 300 kilowatts per month, will have a five-cent rate.

Miscellaneous NEWS NOTES

Vermont Central Station Shortens Working Hours.—The Burlington Light & Power Company has put in force an 8-hour working day for its stationary firemen, at the same wages as those formerly paid for nearly 12 hours per day.

New Utility Bills to Be Considered by Oklahoma Legislature.—The next Oklahoma Legislature, which meets in January, 1917, will be asked by the State Gas, Electric & Street Railway Association to pass a bill giving companies right of eminent domain outside corporate limits of cities and towns, and a bill empowering the Corporation Commission to issue certificates of public convenience before new public-service utilities can operate in given cities and towns.

Purchase of Central-Station Company Denied.—The New Hampshire Public Service Commission has for the second time denied the petition of the Grafton County Electric Light Company for authority to purchase the Mascoma and Lebanon Electric Light & Power Company for $300,000. The commission states that the company may purchase the properties, but places a limit on the price at $165,000.

Wider Scope for Next Electrical Show in Cincinnati.—Successful as was the electrical show held in Cincinnati last November, the company of electrical men which operated it is planning for still larger things for the show to be held November 18 to 25 next. It is to take the form of a national event, under the name of the Ohio Valley Electrical Exposition, and the interest already shown by manufacturers is sufficient to indicate that it may expect sufficient co-operation to insure its success. Requests for space are already being received, and it is evident that the facilities afforded by Music Hall will be taxed even more than last year.

Boston Edison Men at Mexican Border.—Thirteen men of the Boston Edison Company's organization are on the Border with the Massachusetts National Guard; four employees are in the Coast Artillery Corps and served as instructors of recruits; eight are at the Plattsburg, N. Y., officers' training camp, and about sixteen have served or will serve at Plattsburg. All employees on the Border receive full pay for the first thirteen weeks, three-quarters pay for the next thirteen, one-half pay for the following 78 weeks and one-quarter pay while on duty thereafter, not exceeding 396 weeks. The Plattsburg men are also paid. All men are continued in the service of the company, without detriment to their eligibility for company annuity pensions.

Utility Company Seeks Injunction Against City to Restrain Construction Work.—An injunction restraining the city of Loveland, Colo., from payment for tunnel construction work now being prosecuted by the F. C. Dreher Construction Company, on the Big Thompson River and for which application was made in the District Court of Larimer County last week by the Western Light & Power Company, as intervenors in litigation recently closed has been denied. However, an order was entered enjoining the city from payment for the work for 15 days, and the plaintiffs in the action may have the opportunity to carry the application to the Supreme Court on a writ of error for final determination. The power company asked an injunction on the ground that certain stipulations entered in the recent decree and which affect their interests adversely will be reversed by the Supreme Court. These concern the legality of the election at which it was voted to proceed with the construction of the municipal light and power plant and the right of the city to appropriate funds amounting to $12,000 from the general revenue of the city. There is little possibility of further impediment being thrown in the way of the tunnel construction since it is highly improbable that an injunction order affecting its payment can be obtained.

Cincinnati Jovian Outing.—The annual outing of the Cincinnati Chapter of the Jovian Order was held on Saturday, July 29, at Beechwood Park. The feature of the day was the barbecue feast. A ball game and a dozen athletic events filled the program, and were participated in by many of the members. A competent corps of officials, headed by A. C. Beattie as chairman, handled the event.

Electrical Equipment at Osteopathic Convention.—One of the most significant features of the twentieth annual convention of the American Osteopathic Association in Kansas City last week, was the large number of exhibits of electrical devices, and the extensive interest of the two thousand members in the application of electricity to the practice. Osteopaths generally are installing high-frequency machines, and more and more they are adding X-ray machines, and diagnostic and therapeutic instruments.

Quick Trip by Electric in New England.—A trip by electric automobile from Boston to Portland, Me., and return was made recently by Mr. Rogers of the Anderson Electric Car Company and Mr. Kelley, manager of the New England branch of the Philadelphia Storage Battery Company. The run to Portland was made in 7.25 hours, and the return trip in 7 hours, the distance being 129 miles, owing to a detour of several miles. The car was a Detroit electric, taken from stock, and was equipped with Philadelphia thin-plate storage batteries.

Tungsten Production Sets New Record for the United States.—The tungsten production of the United States during the first six months of 1916 exceeded the production of this or any other country in any previous twelve months. Prices were even more phenomenal than production and reached more than ten times their ordinary level. The output was quivalent to about 3,290 short tons of concentrates carrying 60 per cent WO_3, valued at $9,113,000, according to an estimate made by Frank L. Hess, of the United States Geological Survey.

American Electric Railway Convention.—The thirty-fifth annual convention of the American Electrical Railway Association, and its affiliated Associations—the American Electric Railway Accountants' Association, the American Electric Railway Engineering Association, the American Electric Railway Claims' Association, and the American Electric Railway Transportation and Traffic Association, will be held at Atlantic City, October 9 to 13, 1916.

Kansas City Jovians Hold Excursion.—The Jovian Electric Club of Kansas City took its second boat trip of the season, in the Steamer *Chester* on the Missouri River, the evening of July 31. More than 400 persons participated, including about 100 members and members' wives of the Engineers' Club. The event produced about $200 additional for the fund to send the degree team of the Jovian League to the Indianapolis Jovian convention. As another feature of the plans of Kansas City towards the Indianapolis convention, it may be mentioned that P. Loyd Lewis, a member of the Kansas City Advertising Club, is securing the co-operation of that club towards exploiting the advantages of Kansas City in general for electrical goods distribution, and the advantages of Kansas City particularly to the Jovians at the convention.

Northwestern Electric Company Reports Large June Business.—According to George G. Bowen, assistant sales manager of the Northwestern Electric Company, Portland, Ore., his company closed a busy month in June. Contracts were secured for furnishing electric power and steam for the First National Bank Building, Lowengarth's Building, Soloman Building and a new building under construction at Thirteenth and Burnside Streets. During the month 98 electric ranges were sold, of which 20 are to be installed in the Ellis apartment building.

Electricity in Canning Factories

A Discussion of the Advantages of Electric Motor Drive and Central-Station Service in this Industry with a Detailed Description of a Typical Canning Factory

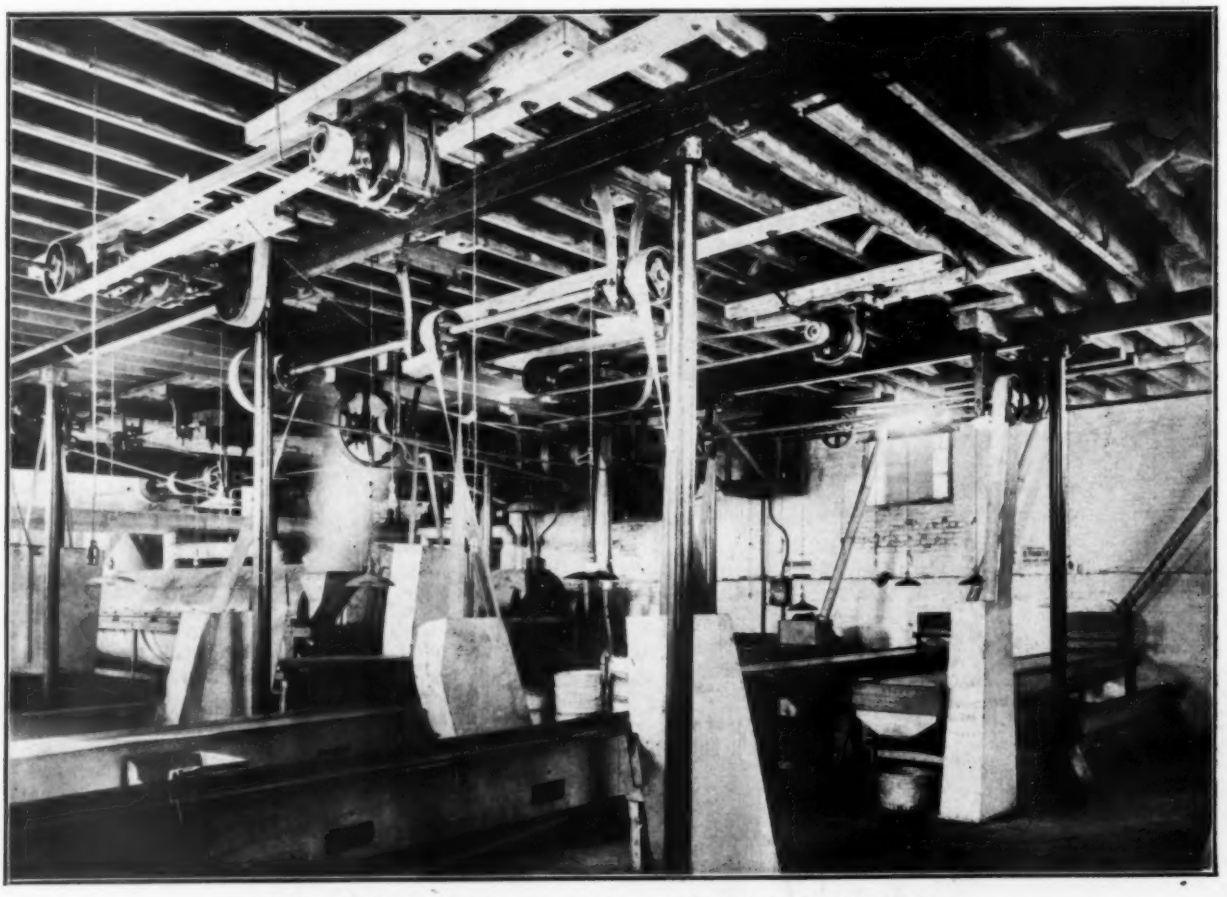
Industrial Power Series—Article No. 174

IT would be a very difficult task to estimate anywhere near accurately the consumption of canned vegetables and fruit each year in this country. When one visits a large grocery establishment and sees row after row of cans of all conceivable commodities, it gives but a slight conception of what a great industry the preparation of canned foods has become. Of necessity the canning plants are widely scattered as for economical reasons they should be located as near as possible to the source of the raw material. When a person sits at a meal in the middle of the winter and eats peas, for instance, with a flavor practically equal to that of the fresh vegetable, and when such goods can be purchased at a price slightly in advance of an equal amount bought during the growing season, it becomes apparent that canning operations have been reduced very nearly to an exact science.

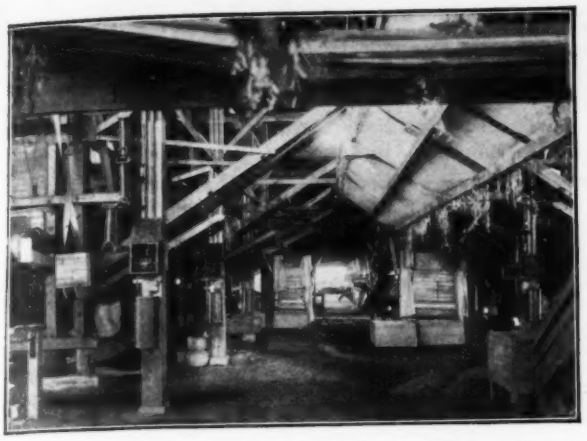
In order to accomplish such results automatic machinery has been developed which handles the majority of the processes from the delivery of the fresh vegetables or fruits to the final sealing of the cans. Power is required to drive such machinery and this leads up to the advantages of electric drive for such work, also the use of central-station power. From the public utility standpoint the canning factory offers a very desirable load as the demand for power is during the summer months and aids in filling in the "valley" which occurs in the annual load curves during this season. The load-factor is comparatively high and the machinery is of such a nature that either direct or alternating-current motors are applicable.

In canning factories cleanliness is fully as important as the "safety first" consideration and electric motor drive forms an important factor in maintaining ideal conditions. Heavy line shafting and belting is largely eliminated so that dripping grease and agitation of dust are reduced to a minimum. Machines can be arranged for the logical sequence of operations without regard to the source of power which is so important when mechanical power from a central power plant is employed. Furthermore, single departments or even individual machines may be operated during working hours or over time to pick up certain processes that may be dragging.

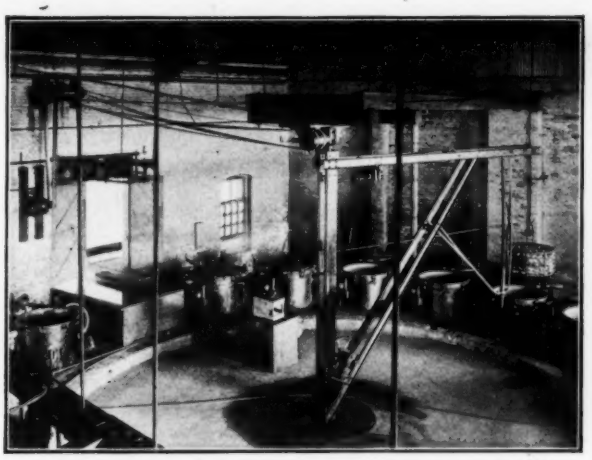
Overhead charges and the maintenance expenses of a power plant are eliminated and excessive friction losses resulting from mechanical drive are greatly reduced. Railroad sidings are clear from coal cars and cars for the removal of ashes, thus eliminating delays in shunting cars of raw material and the shipment of the finished product. There is much less wear and tear of the buildings owing to the reduction of vibration, maintenance charges are materially reduced and fire risks lowered. The continuity of central-station service is practically assured and an accident in one department will not interfere with the operation of other departments. Where mechanical power is used an accident to a boiler or to an engine may mean a



Motors on Ceiling Driving Pea Graders and Pickers in Canning Factory.



Conveyor and Pea Cleaner Driven by 10-Horsepower Motor.



Motor-Driven Circular Hoist in Cooking Department.

serious delay or a complete shutdown for some time. Such an occurrence would be particularly serious where perishable commodities are handled to say nothing of the losses attending the delay in shipments and the trouble of keeping an organization of employees together ready for call to work.

In general there is an increased output and decreased cost of production where electric drive is used owing to more uniform speed and the elimination of belt slippage. The natural lighting is better and a more economical disposition of floor area and a more convenient location of machines are made possible. There is a greater reliability and steadiness of power and freedom from the stoppage of machines that might arise from a hot line shaft journal or broken belt.

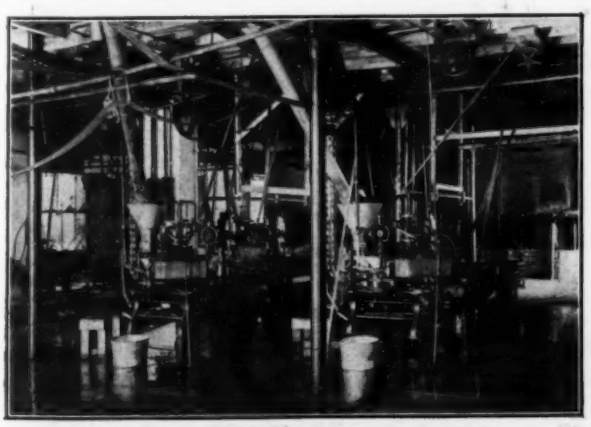
Description of a Typical Installation.

The following description relates to the Lyons, N. Y., cannery of H. C. Hemingway & Company, Syracuse, N. Y., preservers of canned food products. Aside from the Lyons plant, factories are located at Syracuse, Auburn and Clyde, N. Y. The Lyons plant employs electric motor drive exclusively and is one of the most complete and up-to-date establishments of its kind in the country. Before taking up the mechanical and electrical equipment a brief outline of the processes employed will be of interest.

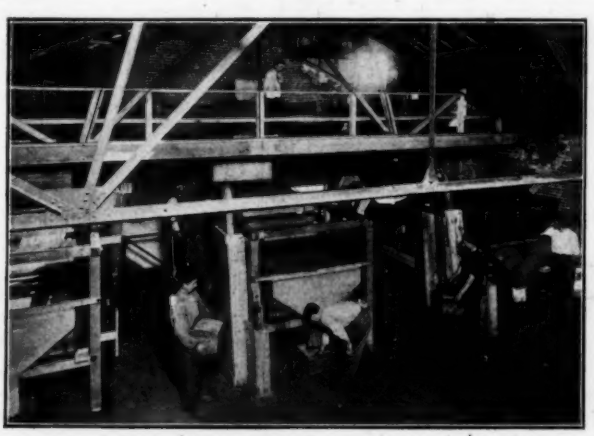
In this locality the canning season extends from about the middle of June until December 1, the various vegetables and fruits being canned as they mature during the season. Saur kraut and apples are the last commodities to be canned. At the Hemingway cannery are canned peas, string beans, corn, tomatoes, saur kraut, apples, beets, strawberries and raspberries. In canning, with the exception of saur kraut which is treated with salt, the chief agent is heat and the object is to retain as far as practicable the natural character and flavor of the article subjected to the process, and to arrest at a given point agencies which would, in the natural course of events, cause decay. Air must be absolutely excluded from the container as the least flaw allows the entrance of bacilli and spoilage will begin. The type of can now in general use eliminates the use of solder as the ends are applied by pressure in such a way as to hermetically seal the can.

Berries and tomatoes are hand packed to better preserve the original form of the fruit and vegetable; saur kraut is also hand packed. The latter commodity is prepared from cabbages which undergo several processes. The cabbage is cored by machines then trimmed to remove the outer leaves and surface dirt, after which it is machine shredded and placed in tanks where it is salted and allowed to remain from three to five weeks before canning. Apples are pared, cored and cut up into quarters by machine methods. String beans are picked when young and tender at the truck farm of the company and at the cannery are washed, graded, parboiled and canned. The processes involved in the canning of corn are husking, cutting, removing the silk and proper cooking. Corn is cooked in special machines for this purpose, where it receives its first cooking and is automatically filled into cans and conveyed to heading machines for sealing.

In the canning of peas machine processes are employed practically from the starting to the finish and an outline of this process will give a general idea of the equipment necessary to perform the many kinds of work. The peas are received at the cannery on the vines and pass through machines for the opening of the pods and removal of the peas. They are then cleaned, graded, washed and receive



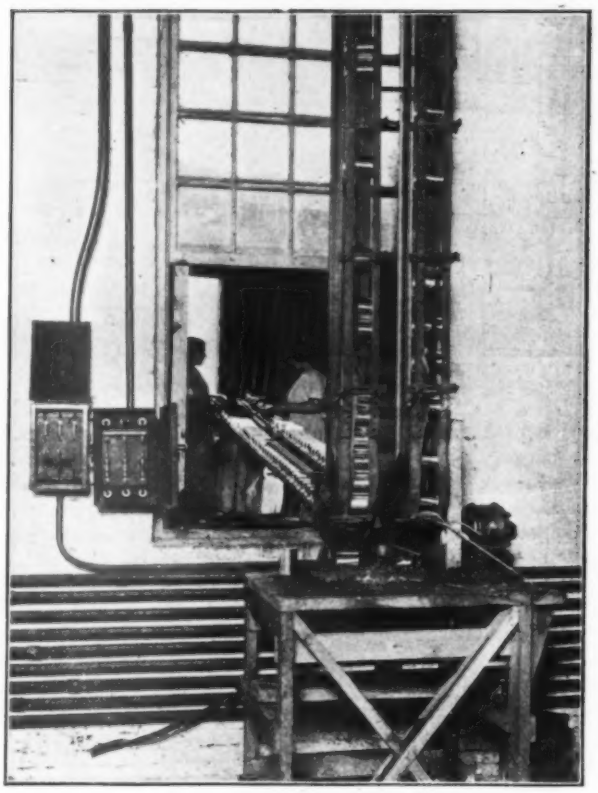
Pea Filler and Heading Machines Driven by Five-Horsepower Motor.



Three Pea Graders Each of Which Is Driven by Five-Horsepower Motor.

the first cooking, and then canned, and again cooked, and cans cooled, and placed in warehouse in cases.

The electric motor equipment includes 32 motors aggregating about 225 horsepower. All motors with the exception of a few fractional horsepower machines, are three-phase, 60-cycle, 220-volt, squirrel-cage type. Service is secured from the lines of the Empire Gas & Electric Company, connection being made to its 2,200-volt, three-phase, 60-cycle transmission lines.



Motor-Driven Can Elevator.

In terms of corn and peas the capacity of the Lyons cannery is 110,000 cans a day of 10 hours. In the canning of peas the first operations take place in the pea shed consisting of an open building with platforms on both sides. The peas on the vine are unloaded from wagons onto the platforms and fed into inclined conveyors which lead to the viners. There is also a storage shed for the peas at one end of the viner building with horizontal conveyors leading to the viners. The viners consist of large revolving perforated rubber cylinders with a series of revolving paddles on an inside shaft which strike the pods and vines and liberate the peas, the latter passing through the perforations in the cylinder. The vines pass through the machines to a series of conveyors and are transferred to a storage space in the yards where they are stacked and during the winter are used or sold for feed or for live stock.

From the viners the peas pass through cleaners where pea pods or chaff is removed by air blast, after which they are transported by conveyors to the main buildings and pass through graders. Graders consist of a series of screens with different sizes of meshes through which the peas pass into receptacles. From the graders the peas go to the picking tables consisting of slowly moving rubber belts. As the peas move slowly along, women on either side of the table remove any foreign substances from the peas. From the picking tables the peas go to the washing machines and then to the blanchers for par boiling. It may be mentioned here that a battery of three low-pressure boilers are maintained and operated for cooking.

New cans as received on the railroad siding are elevated by a motor-driven can elevator to the top of the building and stored. From there they are fed down runways to the filling machines as needed. The filling machines consist essentially of a revolving table which receives the cans and the peas are discharged automatically into the cans in the required quantities. As fast as the cans are filled they are carried by another conveyor to the heading machines which supply the can top and seal same and by still another conveyor are transferred to operators who place the filled sealed cans in large iron baskets. These baskets are placed in cylindrical iron retorts which are hermetically sealed and steam pressure applied at about 15 pounds maintaining a temperature of about 240 degrees. After removal from the retorts the cans are cooled and transferred to the warehouse where they are placed in cases and piled, and after a reasonable time are in safe condition for labeling and shipping.

In the pea shed the north and south conveyors which feed the viners are each driven by a 10-horsepower, 1,200-revolution-per-minute motor. The central straw conveyor for removal of the vines is operated by a 10-horsepower, 1,200-revolution-per-minute motor which also drives one pea cleaner. There are three groups of two viners each driven by a 20-horsepower, 900-revolution-per-minute motor, and two individually-driven viners driven by a 10-horsepower, 900-revolution-per-minute motor. A three-horsepower, 1,800-revolution-per-minute motor operates a single cleaner and the pea elevator for conveying the peas to the main building is operated by an eight-horsepower, 720-revolution-per-minute motor. The accompanying data give the horsepower requirements of the various other machines used.

MOTOR DATA.

Service from Empire Gas & Electric Co. 2,200/220-volts, 3-phase, 60-cycle.

No.	Hp.	Speed		Kind of Drive	Application
1	10	1200		Belt	North pea conveyors in shed.
1	10	1200		Belt	South pea conveyors in shed.
1	10	1200		Belt	Center straw conveyor and North cleaner.
1	20	900		Group	Two viners, North side East end.
1	20	900		Group	Two viners, North side West end.
1	20	900		Group	Two viners, South side West end.
1	10	900		Belt	One viner.
1	10	900		Belt	One viner.
1	2	1800		Group	One grader, one washer.
1	3	1800		Belt	Cleaner, South side of shed.
1	3	1200		Belt	Filtration plant.
1	5	1200		Belt	One grader.
1	10	1200		Group	Two blanchers, two cages, long corn conveyor.
1	10	1200		Group	Corn conveyor, cob conveyor, worm conveyor, six corn cutters.
1	8	720		Belt	Pea elevator.
1	7.5	1800		Belt	Bean grader.
1	1	1800		Gears	Can elevator.
1	2	1200		Belt	Bean shaker.
1	2	1200		Belt	Gas machine.
1	5	1200		Belt	North filling and heading line.
1	5	1200		Belt	South filling and heading line
1	5	1200		Belt	Bath-room hoist.
1	2	1800		Belt	Boiler room pump.
1	5	1200		Belt	Cooling tank hoist.
1	5	1700		Group	Blacksmith shop.
1	½	1750	(110-volt)	.....	New Burt No. 3 machine.
1	6	720		Belt	Elevator.
1	¼	1200	(110-volt)	.....	Knapp No. 2 labeling machine.
2	1.5	1200		.....	Nailing machines.
1	8	720		Belt	Elevator.
1	15	1200		Group	Cob-cutting room.

Kilowatt-hour Consumption 1915.

January	80	July	12567
February	50	August	3102
March	20	September	4034
April	1204	October	4840
May	463	November	2810
June	6490		

Electrical Features of a Modern Substation

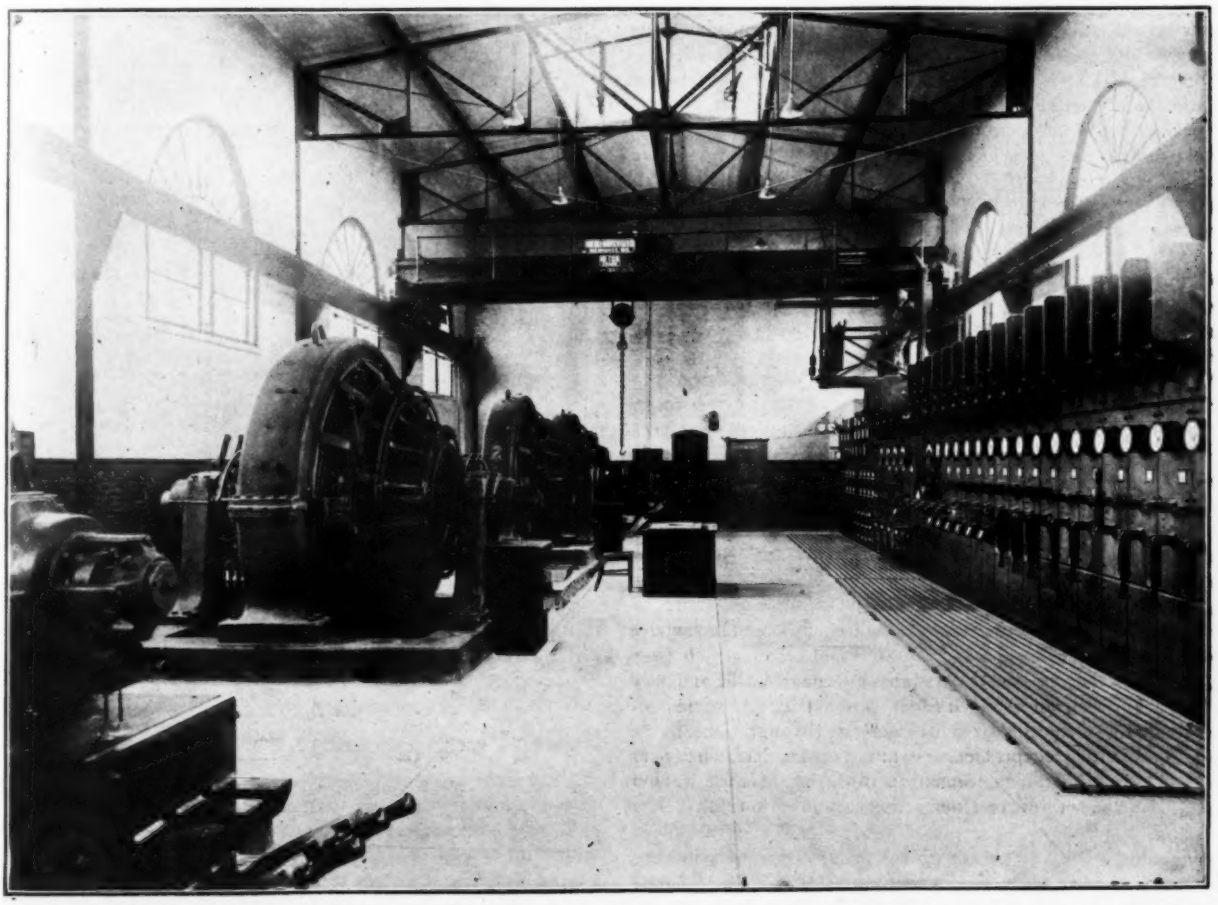
New Station of the Pittsburgh Railways Company Embodies Many Novel and Interesting Points and Is Indicative of Latest Practice

THE recently completed substation of the Pittsburgh Railways Company is an excellent example of modern practice in substation design. Simplicity of operation, reliability of service, and the safety of the operators have been given the utmost consideration. It is located between Brighton Road and Taggart Street, a short distance north of Columbus Avenue, in the Northside district of Pittsburgh, Pa. The building is constructed almost entirely of fire-resisting materials.

The substation equipment consists of four 1,800-kilowatt, 600-volt, six-phase, 514-revolutions-per-minute, commutating-pole, rotary converters; twelve, 625-kilovolt-ampere, 11,000/424-volt, oil-insulated self-cooling, single-phase transformers, and the necessary switchboards and auxiliary apparatus. The station is planned for and can readily be extended to an ultimate capacity of six converters, although the present building will accommodate but four. The high-tension switch structure, switchboard panels, and conduits are installed for the ultimate capacity of the station.

The operating room, containing the converters and the switchboard, is located on the second floor of the building. The converters are of the self-starting type. Each is supported on two foundation walls built on a reinforced-concrete footing course 12 feet square, which serves to support one end of the floor beams. Alternating-current starting panels are provided, mounted in the wall between the operating room and the transformer room so that all switch terminals extend into the latter room just above the low-tension transformer terminals. Each panel contains a double-throw, three-pole knife switch, a zero-reading voltage indicator, and a double-throw, double-pole field discharge switch. Connections from the starting panels to the transformers are made with copper strap supported on bus-type insulators. This form of construction is very rigid and presents a neat appearance. Negative converter panels, each containing a negative switch, an equalizer switch, and a series-field short-circuiting switch, are mounted on the bearing pedestals at the commutator end of the converters. The negative and equalizer busses are supported from floor beams directly under these panels and connections are made with copper strap passing through openings in the floor.

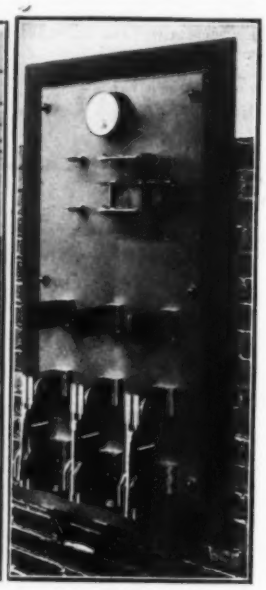
The transformers are arranged in a single row in a one-story room on the first-floor elevation parallel to the operating room, and are supported on I-beams over a ventilating passage extending the length of the room. Air ducts, from outside of the building, connect with the passage, one duct being provided for each transformer bank, and ventilators are installed in the roof over the transformers, so that an excellent circulation of air is maintained. A system of piping permits the draining of oil from any transformer. A feature of these transformers is the neat arrangement of the low-tension copper for which strap is employed.



Interior View of Taggart Street Substation Showing Three 1,800-Kilowatt 6,000-Volt Commutating Converters. Main Switchboard on Right.

The main switchboard consists of 34 Monson slate panels with angle-iron frames and a channel-iron base, supported on a treated hardwood baseboard. The switchboard braces are secured to similar pieces of hardwood mounted on the

Rear View of 34-Panel Switchboard.



Starting Panel for Converters.

wall and extending the length of the board, thus insulating the framework from the ground. The switchboard consists of one battery-control panel, four high-tension cable panels, six transformer panels, six converter panels, one station totalizing panel, and 16 feeder panels. One converter panel and six feeder panels are equipped with an auxiliary bus and double-throw switches, to permit supplying certain feeders at increased voltage in case of trouble at other stations. The switchboard is notable for its extremely neat and compact rear. On the direct-current panels this results from the use of laminated stud breakers and knife switches, which permit of very neat workmanship. The use of standard angle-iron frames also has advantages, as is illustrated by the rear of the alternating-current panels. These have a considerable amount of control and instrument wiring on them, but by wiring them along the web of the angle the appearance of the rear does not show any crowding. The connections on the rear of the direct-current panels are so accurately lined up that it is possible to stand at one end and look through the laminations of the copper strap to the other end. The front of the board has a compact and neat appearance also, resulting from the use of seven-inch alternating-current meters with rectangular glass case watt-hour meters on all of the alternating-current panels. The direct-current meters, except those on the feeder panels are of the long-scale, illuminated-dial type. All direct-current meters except the totalizing ammeter have zero reading some distance from end of scale to permit accurate indications of reversal on any particular circuit, which is possible by the scheme of operation.

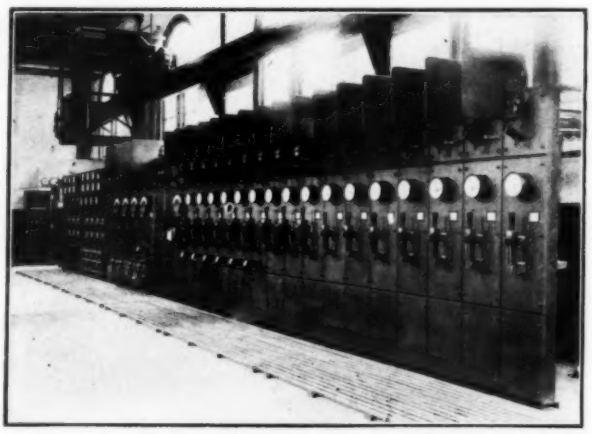
The high-tension switch structure occupies three floors across the Brighton Road end of the building, and is entirely isolated from the remainder of the station by a brick wall. The construction of the switch structure is different from the usual method employed in that it is a combination of reinforced concrete slab and brick. The incoming, 11,000-volt, three-conductor cables enter the high-tension switch structure on the first floor and terminate a short distance inside of the building wall. The 11,000-volt transformer cables leave the switch structure on this floor in four-inch iron pipes. The electrolytic lightning arresters, series and potential transformers, and fuses are located in the switch structure on the first floor. The second floor of the switch structure contains remote-controlled, electrically operated oil circuit-breakers, and disconnecting switches. Four circuit-breakers control the incoming cables and six are for the transformer banks. The third floor of the switch structure consists of the bus-bar compartments, which are entirely inclosed except for small openings at the front and rear of the bus-bar supports. The busses are installed in duplicate, each set being provided with disconnection switches for sectionalizing.

On the first floor under the operating room is a motor-generator set, consisting of a five-horsepower, 600-volt, shunt-wound, direct-current motor, direct-connected to a four-kilowatt, 125-volt, compound-wound, direct-current generator. For approximately 20 hours a day the control circuits are energized from this set. A 60-ampere-hour, 125-volt, lead-plate storage battery, in a small fireproof and vaporproof room on the first floor, is utilized for the operation of the control circuit during the remaining four hours.

Relays of the reverse power type are provided on the incoming cables. Definite time-element, overload relays and low-voltage relays are installed for the protection of the transformers and to disconnect the converters from the alternating-current source of supply in case of trouble. The direct-current circuit-breakers are equipped with shunt tripping coils, and are electrically interlocked with the transformer circuit-breakers so that if a transformer circuit-breaker should open a corresponding direct-current breaker will also open.

Each outgoing direct-current feeder is equipped with an aluminum-cell lightning arrester and six similar arresters are connected across the direct-current busses. An interesting feature of the distribution system is the use of insulated negative cables, which are distributed over the district in the same manner as the positive feeders.

The substation was erected and the equipment installed under the direction of F. L. Aime, engineer for the Pitts-



Front View of 34-Panel Switchboard Installed in Taggart Street Substation, Pittsburgh, Pa.

burgh Railways Company. The equipment was all supplied by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Power Plants As Large Tax-Producing Assets.

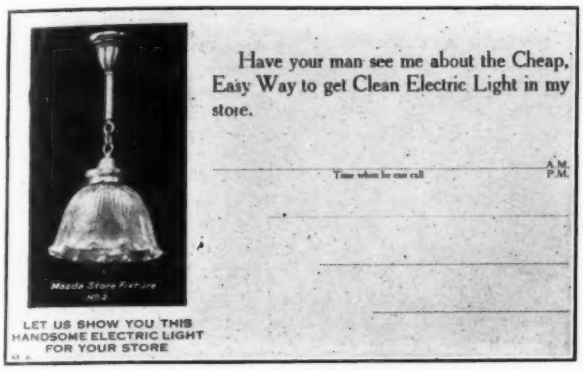
According to figures compiled in the county assessor's office, Clackamas County, Oregon, the power plants and lines of that county deserve to be ranked as tax-producing assets with other large revenue producers. Four power plants in Clackamas County have an assessed valuation of $1,411,720, while 902,013 miles of power lines are assessed at $1,098,-651.83, the total of these items being $2,510,371.83.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Boston Pushes Store-Lighting Campaign.

The Boston Edison Company is mailing the accompanying postcard form, with the company's address on the reverse side, to a store lighting list, with the suggestion that an electrically lighted store puts the proprietor in the


Mazda Store Fixture No. 2
Have your man see me about the Cheap, Easy Way to get Clean Electric Light in my store.
Time when he can call
A.M.
P.M.
LET US SHOW YOU THIS HANDSOME ELECTRIC LIGHT FOR YOUR STORE

Post Card Used in Store-Lighting Campaign.

"points-with-pride" class. The prospect is asked to compare his establishment with stores brilliantly lighted with electricity, noting the difference in coolness and fresh air in contrast with one that is gas-lighted. Electric front lights attract passers-by, it is pointed out, and the interior illumination attracts, too.

The Boston Edison Company allows its customers who are newly wired to pay on easy installments.

New Street-Lighting Rates for New Brunswick.

A new contract is about to be entered into for the lighting of the streets of the city of New Brunswick, N. J. The only bidder for the contract was the Public Service Electric Company, who submitted the following prices:

400-candlepower, Type C, incandescents, $66 per year.
600-candlepower, Type C, incandescents, $80 per year.
2,000-candlepower arc lamps, 250 units, at $80 per year.
2,000-candlepower arc lamps, more than 250, $75 per year.
For each added 50 units a reduction of $5 each per year.
1,000-candlepower, Type C, incandescents, $104 per year.

For the above, if more than 250 units are installed, $61.88, $75, and $97, respectively, are the prices asked of the municipality.

Kansas City Company Sells 10,000 Irons in Campaign of One Month.

The Kansas City Light & Power Company sold during July slightly more than 10,000 electric irons, the price being $2, "nothing down, eight months to pay." On the last day of the month, the telephone orders, and the customers in the Electric Shop, were so numerous that several other departments had to be given over entirely to handling the business.

The July retail trade in electrical devices in the Electric Shop of the company was, in volume of cash receipts, about one-half the total volume of the year 1915. Much of this increase is attributed to the bargain sale of irons, which brought thousands of customers into the Shop, who in a great number of cases bought other appliances in addition to irons. The fan sale was particularly heavy—so heavy in fact that few fans remained for disposition in August.

Another result of the iron sale is the stimulation of wiring business. It was considered interesting, that many people responded to the advertising of the irons, whose houses were not wired for electricity. They came in and bought irons, at the same time giving the order for the wiring of their houses, that they might take advantage of the irons purchased at the low rate. Of course the attractiveness of using an electric iron was the inciting cause to start with, the chance to buy at a low price now urging the immediate availment of electric service.

Many of the electric irons were bought by laundries, some taking ten or more. There was no restriction on any purchaser. Some customers were later discovered to be from Kansas City, Kans., patrons of the municipal plant there; they paid cash for the irons.

Price List of Appliances Shows Installment Terms.

The Narragansett Electric Lighting Company, Providence, R. I., sells all kinds of domestic appliances at a profit, but allows its customers to pay for any appliance on easy terms, averaging about 10 per cent down and 10 per cent a month, with a minimum payment of 50 cents.

Small motors and portable lamps are an exception to the general rule; for these a 20 per cent first-payment is required, with 20 or 10 per cent installments per month.

The company has issued a convenient pocket folder showing the prices and payments for all sorts of appliances and devices carried at its Electric Shops in Providence, Bristol, East Greenwich and Arctic. All the appliances listed are demnstrated at the shops.

ELECTRICAL APPLIANCES SOLD AT THE ELECTRIC SHOP

Prices and Easy Payment Terms

	PRICE	First Payment	Monthly Payment
Bell Ringing Transformer	$2.50	$ .50	$1.00
Chafing Dishes—			
"Universal"	10.00	1.00	1.00
"Hotpoint," Small size	6.00	.50	.50
Curling Iron (For Comb add 50c.)	3.50	.50	.50
Curling Iron Heaters	3.75	.50	.50
Entree Dish	11.00	1.50	1.50
Flat-Irons—			
6 lb. "Hotpoint"	3.50	Nothing	1.00
Boudoir Set	4.50	Nothing	1.00
Food Warmer, "Simplex"	20.00	2.50	2.50
Hair Dryer	13.00	1.50	1.50
Heat Pads—			
Flexible Metal	6.50	.50	.50
Non-Flexible, Aluminum	5.00	.50	.50
Kitchen Power Table	35.00	5.00	2.50
Liquid Heaters—			
El Bollo, Small size	3.50	.50	.50
El Bollo, Large size	4.50	.50	.50
El Bollo, Crook-neck	3.50	.50	.50
Nursing Bottle Warmer	6.50	.50	.50
Water Cup	6.50	.50	.50
Shaving Mug	3.00	.50	.50
Motors—			
½ H. P. Horse power		20%	20%
Phonograph	15.00	1.50	1.50
Ovens and Cookers—			
Ovenette	3.50	.50	.50
El Bako	8.00	1.00	1.00
El Cooko	30.00	1.00	2.00
Percolators—			
Pot Style, Nickel, 3 cups	7.50	.50	.50
Pot Style, Aluminum, 8 cups	8.00	.50	.50
Machine Style $9.50 and	10.00	1.00	1.00
Urn Style	15.00	1.50	1.50
Plate Warmer, "Simplex"	$20.00	$2.00	$2.00
Portable Lamps	10.00 or over	20%	10%
Radiators—			
"Universal"	6.00	.50	.50
"Despatch"	7.50	1.50	.50
"Luminous"	12.50	1.50	1.00
Foot Warmer	6.00	.50	.50
Sewing Machine Motor	15.00	1.50	1.50
Stoves, Disc—			
Westinghouse	4.75	.50	.50
"Thermax," 6 inch	4.00	.50	.50
"Hotpoint," 6 inch, 3 heats	5.00	.50	.50
Stoves, Glowing Coil—			
El Glostove	2.75	.50	.50
El Tostove	4.00	.50	.50
El Grilostove	5.00	.50	.50
Grill, "Universal"	5.50	.50	.50
Table Range, "Universal"	18.00	1.50	1.50
Tea-Ball Teapots—			
"Hotpoint"	8.50	.50	.50
"Universal"	9.00	.50	.50
Toasters—			
El Tostove	4.00	.50	.50
El Tosto	3.75	.50	.50
Twin	8.00	1.00	1.00
Vacuum Cleaners—			
"Eureka" (For Attachments add $4.75)	29.50	2.50	2.50
"Brilliant" (For Attachments add $7.50)	19.50	1.50	1.50
Vegetable Dish	13.00	1.00	1.00
Vibrators—			
"New Life"	11.50	1.00	1.00
"New Life"	13.50	1.25	1.25
"New Life"	15.00	1.50	1.50
Washing Machine ("Eden")	85.00	5.00	5.00

Because of the rapidly increasing cost of the materials used in the manufacture of Electrical Appliances, the prices listed are subject to change without notice.

Price List of Appliances, Showing Terms.

LOUISVILLE COMPANY ADOPTS NOVEL METHOD FOR PAYING EMPLOYEES.

Deposits Salary In Bank Thus Reducing Expense and at the Same Time Encouraging Thrift Among Help.

Auditors, treasurers or other officials of public utility companies, as well as other large employers, find the few days before pay-day a good deal of a grind. When a check-signing official is new on the job the novelty of affixing his name to a large number of checks may dwarf the arduous features of that gentle indoor sport, but by the time the experience has been gone through with ten or a dozen times it gets to be exceedingly irksome, and is worse and worse the longer it lasts. A pay day once a month is bad enough, but when there is a state law requiring semi-monthly pay days, as Kentucky and some other states have, that is still worse and still more of it. And it means, among other things, that not only the check signers but the accountants in the time-keeping departments, are expending a lot of unproductive time and effort.

Even when employees are paid off in cash there is a lot of machinery involved, the time of the paymaster and his assistants, not to mention the risk of transporting such sums of money around as must be handled when a big company pays off in cash. A certain considerable amount of work has to be done in making up the payrolls of any large employer, undoubtedly. Even the office employees working on a flat salary basis must be checked up or there is likely to be an undue amount going to employees who have had too many days off. No large employer will question a statement that it would be very desirable to eliminate as much of such details as possible.

That is what the Louisville Gas & Electric Company has done to a considerable extent, having adopted a plan which promises to develop to the point where it will become almost general, so far as the steady employees of the concern are involved. Instead of making out checks for each individual on the payroll of the company, approximately 200 of them are paid through an arrangement with the company's bank, which has opened accounts with each of the 200 participating. There are, of course, four or five hundred other employees of the company who are not participating in this plan, some of them because they prefer not to, some of them because they have accounts with banks other than that with which the company does business, and some of them because they do not work from month to month.

All but three of the persons on the payroll of the office are paid by this means, the three exceptions being listed in the group with accounts previously existing in other banks. The same plan also takes care of the employees stationed at one or another of the company's stations, some of which the paymaster does not have to visit at all. Construction gangs and the labor class on the company's payrolls are expected to be the last to come under the system. Otherwise it is likely to develop until the point is reached where about all the Louisville company will have to do on pay days will be to tell the bank to settle with its employees and transfer the cash from the company's account.

The method is not intricate. Up to the point where the checks are to be made out, the payrolls are totalled as ordinarily. On the books of the company the names of those who are paid through the bank are approximately indicated. As the bookkeeper on the job comes to these names they are entered on a separate sheet, together with the sums due to them. This sheet is in the form of a voucher and when completed and duly verified, it goes to the desk of Leon S. Mayer, auditor of the company, who affixes his signature. It then becomes an order on the bank to credit the accounts of the depositors named with the amounts set opposite their names. The sheet goes over to the bank with the daily deposit, and the rest of the work is done by the bank clerks.

The plan was worked out about a year ago and then put up to the employees. There is no coercion, in any shape or form about it, and no employee who does not wish to participate need do so. For that matter almost anybody is pleased to have a bank account and to be able to disburse his salary by checks and when the opportunity is presented to open an account with one of the city's leading banks, vouched for by the Louisville Gas & Electric Company, the usual course has been to embrace it gladly. The average individual appreciates the desirable features of making use of a bank and when the way to such a method of handling his finances is opened the rest can safely be left to the employees. In the offices of the Louisville Gas & Electric Company, at least, it has proved so.

Before any employee opens a bank account in the manner indicated, he first signs a contract with the company, in which the conditions surrounding the deal are set forth. The contract was drawn up by a competent attorney and then gone over by attorneys accounted illustrious in Kentucky, so ought to stand any possible test. It runs as follows:

(1.) The Louisville Gas & Electric Company, Incorporated, is hereby designated by me, as my attorney in fact, to deposit with the National Bank of Commerce, of Louisville, Ky., to the credit of my account, the full amount due me as an employee of said company, not later than the fifth day of each following month for all moneys for service for the last half of the preceding calendar month, and shall deposit not later than the twentieth day of the same calendar month all moneys earned by me for service furnished the first half of the same calendar month. The full amount hereinbefore referred to shall be construed or be considered as the full amount of moneys earned by me, less deductions which are a proper charge against me.

(2.) All moneys deposited shall be subject to withdrawal by check in the usual manner.

(3.) Upon the first deposit to my credit, the National Bank of Commerce shall issue a pass book for my account and I agree to abide by the rules established by the National Bank of Commerce for the government of its depositors.

(4.) The company shall arrange with the National Bank of Commerce, of Louisville, Ky., so that the bank shall notify me by a notice inclosed within an envelope to be deposited in the United States mail on the date that the money is deposited by the company, and such notice shall show the amount credited to my account.

(5.) The deposit of the money earned shall be considered and shall constitute a receipt in full for wages earned during the period for which they were deposited.

(6.) Unless the paymaster of the company is notified within ten days from the date of deposit of an alleged error, either in rate or in number of hours allowed, it is agreed that no such claim shall be made by me.

(7.) In case of garnishment only the difference between the amount earned and the amount held by the court as attached, shall be deposited to my credit.

(8.) Employees leaving the service will be paid only with pay check, and the last check shall constitute a receipt in full for all services rendered the company from the date of employment to the termination of service.

I have read the foregoing and agree to comply with the rules.

At the same time as the employee signs the foregoing contract he also fills in the signature card of the bank.

These are the regular signature cards used by banks, designed for the card index files, and to be filled in with the signature of the depositor, his address, and the name of the individual introducing the depositor. These cards, delivered to the bank, are duly filed, while the contracts, signed, are filed by the Louisville Gas & Electric Company, and the change in the status of the individual employee indicated on the books. Thereafter paying off of that employee is simplified for the company.

On the other hand, however, the proposition is distinctly a welfare undertaking. Anybody who knows from experience does not need to be told that the individual who disburses his earnings in the form of currency, disposes of them more quickly than where they are administered through the bank. The average individual appreciates the same thing, but also fails to open account because of the doubt, or actual information, that the volume of his handlings would not be enough to interest the bank. Here, however, the company takes the initiative, introduces the depositor to the bank, and without having to go through the trials of a personal interview, a bank account is established and the moderate salaried individual pays his bills by check, thus gaining a distinct prestige with those he patronizes. And the company, saving labor, saving paper, and reducing the chances for errors is at the same time conferring a direct benefit on the employees.

That the benefit is actual may be indicated beyond question by the fact that where garnishment proceedings used to be frequent and more or less numerous every pay day, they now are almost unknown, and, furthermore, not an employee who has embraced the new plan has been the subject of that kind of attention from a creditor. The company used to find it necessary to administer the earnings of numbers of its employees in order to keep importunate creditors from the garnishment courts—now there is only one such arrangement in force, and that will speedily be closed by liquidation of the employees' claims.

Thus the plan helps the employee to side-step extravagance and extortion by encouraging and fostering thrift. It also gives each individual a consciousness of worth and substance and a self-respect which does not sit well on those who meet their bills and pay their way on the cash-in-hand plan. It may or it may not be considered gilt-edged business by a bank. The National Bank of Commerce, however, very gladly and cheerfully agreed to the proposition, which means that the total of its deposits on the Louisville Gas & Electric Company pay days are fattened to the extent of about $7,200. Otherwise this money would have been drawn out by those who cashed the employees' checks. Now the bank, besides carrying the amount on its books for a varying length of time, sees 200 depositors being trained in the ways of good financing, schooled in husbanding their earnings and accustomed to the benefits of thrift.

The Louisville Gas & Electric Company has found the rule a good one that works both ways.

Electricity and Motion-Picture Theaters.

A tip for central-station men may be taken from current issues of the motion-picture publications, in which there are many notices to the effect that theaters are closing down during the summer heat for the reason that people simply will not patronize them when it is a case of sitting and sweltering inside the auditoriums. There are two "leads" here—one, of course, suggests equipment for the house which is not well ventilated with forced draught and the other the urgent recommendation to the theater managers that they make good their statements about the interiors of their houses being cool. Many theater managers adopt the penny-wise and pound-foolish plan of shutting down the forced draught and chilled air systems when there are only a few people in the house, some of them even shutting off the fans at such times, merely to economize on electricity and water. Of course the chances of the patron returning to such a house after one uncomfortable experience is reduced, all the more so if he has discovered the ruse and has assigned his probable explanation of the reduced service. A big bill for electricity represents one of the best hot-weather investments a picture theater man can make.

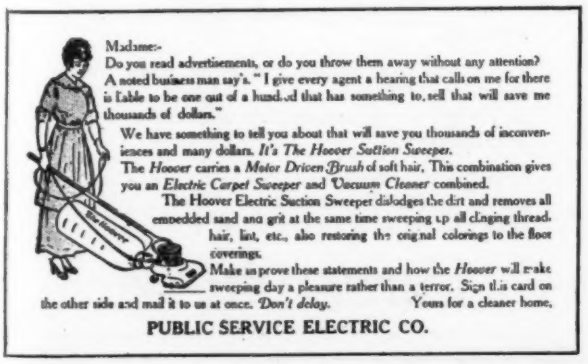
Home Laundrying Commercially Profitable With Electric Washer.

By the use of an electric washing machine a widow at Trenton, N. J., is enabled to make a substantial livelihood doing laundry work at her home, without the sordid and laborious toil involved in old-fashioned methods. A short time ago she bought of the Public Service Electric Company a No. 25 Thor machine, paying for it in installments of $10 per month. The woman does 12 to 15 washings each week, averaging $1.50 each, or about $20 for the average gross weekly income. Energy costs her about 5 cents per kilowatt-hour. This and other expenses eliminated, leaves a net weekly income of $16 and $18, which is much more than it would be possible to earn at most other occupations.

New Jersey Company Utilizes Mailing Cards Freely.

In its campaign for the introduction of domestic appliances, the Public Service Electric Company of New Jersey utilizes a large number of return mailing cards, self addressed to the company's local office.

Some of the recent campaigns have been on toaster stoves, vacuum cleaners and suction sweepers. The accompanying reproductions show the company's method of interesting its customers in these household conveniences. Usually both sides of the cards are printed on the back for a description of the device, and its price, and the face of the card for the address of the company.



Madame:-

Do you read advertisements, or do you throw them away without any attention? A noted business man say's, "I give every agent a hearing that calls on me for there is liable to be one out of a hundred that has something to sell that will save me thousands of dollars."

We have something to tell you about that will save you thousands of inconveniences and many dollars. *It's The Hoover Suction Sweeper.*

The *Hoover* carries a *Motor Driven Brush* of soft hair, This combination gives you an *Electric Carpet Sweeper* and *Vacuum Cleaner* combined.

The Hoover Electric Suction Sweeper dislodges the dirt and removes all embedded sand and grit at the same time sweeping up all clinging thread, hair, lint, etc., also restoring the original colorings to the floor coverings.

Make us prove these statements and how the *Hoover* will make sweeping day a pleasure rather than a terror. Sign this card on the other side and mail it to us at once. *Don't delay.* Yours for a cleaner home,

PUBLIC SERVICE ELECTRIC CO.

Public Service Electric Company,

Dear Sirs:

Please send to my home for my inspection an electric toaster-stove. It is understood that I shall be under no obligation to buy the toaster-stove, if I do not so desire.

Name _____

Address _____

Two Mailing Cards Used by New Jersey Company in Appliance Campaign.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

SECURING POWER BUSINESS BY DIRECT-BY-MAIL ADVERTISING.

Experience of the Texas Power & Light Company Indicates Much Profitable Business Can Be Secured.

The average central station with a known list of prospects and in most cases no competition has an admirable opportunity to use the mail as a means of reaching prospective buyers of its service. More and more central stations are using this form of advertising and generally with good results.

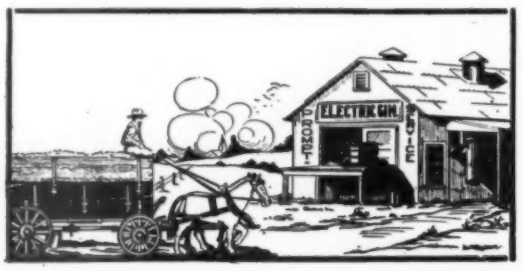
There are several points which are well to keep in mind when making an appeal to the prospect by means of letters, circulars or booklets.

More important than any other is the classification of prospects into groups to which a special appeal can be made. Even if the cost of reaching the prospect is twice as great there is little doubt but that the specific appeal is more effective and that the results will more than repay the company for the additional expenditure.

It may be of interest to central stations who have done little of this work to hear how one of the smaller companies handles this class of advertising.

The Texas Power & Light Company covers a large field and on this account newspaper advertising featuring electric power is impractical on account of the large number of papers which have to be used in order to reach all the prospects.

Early last year, a mailing list of every power prospect in the territory was made up from records which are kept regularly in the office. There are approximately 350 of these. This is a rather small mailing list to work economically on account of the relatively high cost per unit when buying special circulars in such small quantities.



WHEN A FARMER

GOES TO TOWN WITH A LOAD OF COTTON

1. He is anxious to get this cotton ginned as soon as possible after he gets there and then go on about his business.
2. If it is a damp or rainy day, he may not want to store his cotton in a cotton house while it is in that condition. And even if he should consent to store it, he goes away uneasy, feeling that possibly a fire may break out and destroy the bale.
3. Everything else being equal he is going to take his cotton where he is sure of getting it ginned at the earliest possible moment and without delay.

THE RESULT

Naturally he picks out the electric gin which he knows is always ready to go.

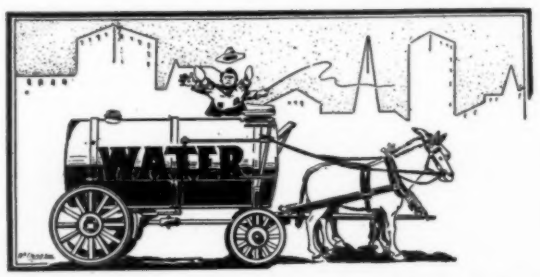
One of our electric gin customers recently told us that he was able to gin about 300 bales of extra cotton during the tail end of the season simply because the farmers knew he was ready to gin every day in the week, while the steam gins only operated on special days.

EXTRA BALES MEAN MORE MONEY

TEXAS POWER & LIGHT COMPANY

"Service First"

G6



DID YOU EVER CONSIDER

that when a ginner adopts electric drive he "falls off the water wagon" so to speak.

Water supply plays an important part in the steam gin. Even if you have a good supply of water available you have the element of cost to deal with which is not present in the electric gin.

If you are not favored with an unlimited supply of fresh water you may at some time or other be put in the unique position of shutting down your gin on account of water shortage.

Then, too, bad water, although there may be plenty of it, is a constant source of trouble and expense in connection with boiler tubes and heaters.

Everything considered, the use of electric drive and the consequent "falling off the water wagon" is an important point.

TEXAS POWER & LIGHT COMPANY

"Service First"

G1

Two Mailing Cards Used with Marked Success by the Texas Power & Light Company in Securing Power Business.

A few mailing cards have been used, but circular letters on special letterheads have been the main method of attack.

In order that the cost per unit shall not be too great, a number of special letterheads are designed at one time and all printed together. One thousand of each kind is printed. These letterheads are of a nature that will appeal to all prospective power users and usually consist of half-tone reproductions of typical power installations, several different types of installations being used in most cases on one letterhead. Each quantity will supply the mailing list for three mailing, so it will be seen that four different letterheads will suffice for a year's mailings when the letters are sent out at intervals of one month. Such good results have been obtained during the past year that it is probable all power prospects will be circularized twice a month during the coming year.

The list is classified into

Cotton Gins
Cotton Oil Mills
Brick Plants
Flour Mills
Railroad Shops
Cotton Mills
Ice Plants
Waterworks
Miscellaneous,

the cotton-gin class constituting the largest single group.

As an example of the specific appeal, a campaign was planned last fall for the purpose of interesting the cotton gins. The company already had 61 gins on its lines.

A series of 14 pieces of mail matter was planned, mailings being made every week. These consisted of six letters, six post cards, and two mailing cards.

Reproductions of the two mailing cards used are shown on the preceding page.

This set of 14 pieces was sent to 160 cotton-gin prospects for electric power for a total cost of $65. This amount includes everything except the writer's time in dictating the letters and getting up the copy for the cards.

No attempt was made to get replies to the circular matter sent out, the idea being to help the salesman as much as possible.

In numerous instances this advertising matter was mentioned by prospects to power salesmen and the benefit obtained from such a small expenditure was no doubt far reaching. Contracts for 40 additional cotton gins were obtained during the season.

The company has gone still further in the matter of the cotton gin. An attempt was made last season to increase the number of bales ginned, by advertising in rural newspapers directly to the farmer the benefits of the electric gin.

The electric gins were informed as to what the company intended doing in this respect and as a result, a number of these gins carried advertisements in the papers on their own account.

An effort was also made to have these gins paint signs on the sides of their gin house, advertising the fact that theirs was an electric gin. This effort also met with success in a number of cases and is being followed up this year.

To further interest the farmer in the advantages of the electric gin, the company has had printed this year a large number of folders, which are being furnished gratis to all electric-gin customers. These are for distribution among the ginner's patrons and prospective patrons.

The first page contains a "Cotton Picker Table" by means of which the wages of any employees can be figured for any amount of cotton picked at an ordinary rate. On the inside of the folder a place has been provided for the farmer to keep a record of his entire cotton crop. The idea of this was to encourage comparison between the electric gin and the steam gin.

This is the first work in the form of "dealer helps" that the company has done. This idea met with instant response on the part of the electric ginners as is shown by the fact that a circular letter and follow-up announcing the free distribution of the folder has produced 50 per cent returns. Orders totaling 20,000 copies have been received.

If only half of these are distributed (the chances are that practically all of them will be used as orders have been carefully handled), that will mean that 10,000 farmers will read and use this folder. Incidentally it might be mentioned that the fourth page is devoted to the advantages which the electric gins offer the farmer.

The folders are inclosed in a manila envelope, which protects them from being soiled when carried in the pocket. A space is provided on the outside of the envelope for the patron's name as well as the name of the ginner.

The company has only as yet scratched the surface as regards this type of advertising and expects to extend the work being done as rapidly as feasible.

Little work has been done on commercial and residential prospects except during special campaigns. It is probable that this work will be developed rapidly in the near future.

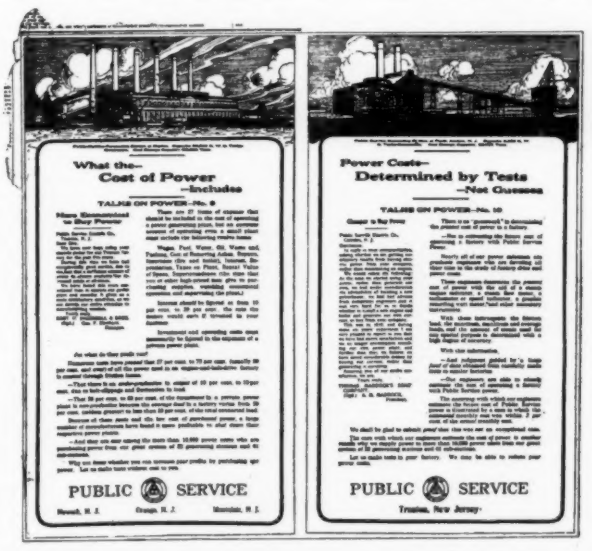
Any kind of advertising is ineffective unless it is properly followed up. Direct advertising is not an exception to this rule.

It is, however, a wonderful wedge when rightly applied.

Power Costs Studied by Salesmen.

As noted in our issue of June 17, 1916, the Public Service Electric Company of New Jersey is presenting a series of central-station "talks" on power and other phases of industrial service, in the form of quarter-page advertisements in leading newspapers in the territory. We present herewith two new advertisements. At the head of each will be seen a picture of the company's 9,000-kilowatt generating station at Perth Amboy, N. J.

The company supplies power to more than 10,000 users from its system of 22 generating and 61 substations. It has a corps of power salesmen who are nearly all graduate engineers and devote their time to the study of factory



Two Recent Advertisements of New Jersey Company.

drive and power costs. They determine the present cost of power with the aid of a steam-engine indicator, a steam flow meter, a tachometer, recording wattmeter and other instruments.

With these instruments the friction load, the maximum, minimum and average loads, and the amount of steam used for any special purpose, are determined with great accuracy.

From the information obtained, and from judgment

guided by a large fund of data gleaned from other factory tests, it is possible to estimate very closely the cost of operating with Public Service Company power.

The company in one case estimated within three per cent of the actual monthly cost of power contracted for by an industrial concern. This was by no means an exceptional case.

Motor Drive Increasing in Stone Dressing.

The use of electricity in the handling and the finishing of granite is growing in favor among the granite men at Quincy and Rockport, Mass., and Barre, Vt., in each of which centers a larger volume of central-station energy is being used year by year. Heretofore, compressed air, produced in a number of steam plants near the finishing works, has been the usual type of power for drilling, hammering and polishing the stone. This is still used at Quincy in considerable volume, this being one of the oldest and most conservative stone-making centers in the country. It may be noted in passing that Quincy granite was used in the construction of Bunker Hill Monument, early in the nineteenth centry.

At Rockport, Mass., and Barre, Vt., electric power is used in large amounts, and for some of the processes, almost exclusively. Individual drive for the various finishing machines is becoming more in vogue. Polishing wheels are driven by a 10-horsepower motor, with a 1.5-horsepower motor to raise and lower the polishing disk, which revolves on a layer of steel shot.

At Barre, cheap power, derived from the abundant waters of the rivers, is particularly favorable to the industry. At Rockport, Mass., the introduction of central-station electric power from the Gloucester Electric Company may be said to have just been begun, with good prospect of its increasing use as time goes on, and as existing air compressing machinery wears out.

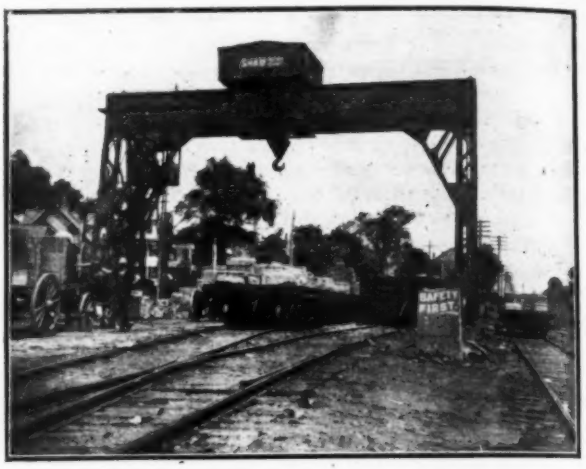
At Quincy, a number of yards have a single large motor which drives an air compressor which operates the hammers, and in addition the motor operates the derricks for lifting the stone about the yard, and, in certain cases, it also operates revolving-disk polishing machines, from a line shaft.

One such motor, of 50-horsepower rating, drives an air

Typical Granite-Dressing Yard.

compressor of 170 cubic feet of free air capacity, a water pump, a derrick with 60-foot mast and 50-foot boom, two polishing machines, and a grindstone. Another yard has a 50-horsepower motor operating four polishers and a derrick. There are also two five-horsepower motors, one of which operates a suction device which exhausts the stone dust from air hammers used on heavy pointing work, and the other drives a grindstone used in repairing the tools. A 20-horsepower motor drives a derrick.

Various concerns utilize electric motor drive on yard cranes. These are erected on runs, each of which is built



Electric Crane Handling Granite.

up on the fronts of two opposite sheds, the crane spanning the yard and giving access to all the stone stored there, both rough and polished. The crane delivers the finished product to flat cars at the end of the yard. Usually 15 to 25-horsepower motors are employed for operating the hoists, and about 10 horsepower to drive the trolleys.

A large yard crane at the railroad siding in Quincy is of 40-ton capacity and is equipped with two 40-horsepower and two 30-horsepower motors. The energy is three-phase alternating current, supplied to all the Quincy yards by the Quincy Electric Light & Power Company. The local rate is based on a 10-cent price, less 65 per cent, for quantity with 15 per cent for prompt payment. This brings the net rate to about 3 cents per kilowatt-hour, making the average cost for operating a 50-horsepower equipment at a yard about $75 per month.

The business is peculiarly advantageous to the central station in that the granite working is performed entirely during daylight hours and does not overlap the lighting peak. It is a type of service that is bound to grow, especially in regions where hydroelectric power is obtainable.

Box Factory Takes Central-Station Service.

A box-manufacturing plant at Spencer, Mass., which formerly ran with power from a 50-horsepower boiler and steam engine, has installed a 10-horsepower and a three-horsepower electric motor, which are used for sawing, planing and grooving. Steam being required to melt glue used in process, a two-horsepower gas-fired steam boiler was put in, thus making the use of wood for fuel entirely superfluous.

Since the same utility company in the town furnishes both electricity and gas, the box manufacturer has to deal with only one "central station" for both his power and heating.

Power Gains for Massachusetts Central Stations.

Increasing power loads, reflecting the unusual industrial activity, are registered by central-station companies in New England. Among the smaller electric companies in Massachusetts, the Spencer company gained 360 horsepower during the year to July 1; the Leominster company gained 381 horsepower; Milford gained 296; North Adams 243, Clinton 316, and Adams 32.5.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

TRIAL INSTALLATION OF CONCENTRIC WIRING.

Some Details of the Equipment in a Small Frame Two-Flat Residence in Chicago.

Recently an experimental installation of concentric wiring was made in the modest frame two-flat building at 3424 North Troy Street, Chicago, by the Commonwealth Edison Company. In view of the widespread study now being devoted throughout the country to the subject of less expensive interior wiring methods for small houses and the premises of people of moderate means, a brief account of this installation may be of interest.

Photograph Courtesy Commonwealth Edison Co.
Fig. 1.—Two-Flat Building in Chicago in Which Concentric Wiring is Installed.

The building selected for the experiment was well suited for the purpose. It belongs to the Commonwealth Edison Company, having been acquired with some other property, and had never been wired. The building is shown in Fig. 1. It contains two flats, or apartments, one above the other, and a basement. Each flat consists of an entrance hall or vestibule, a living room, two bedrooms, a kitchen, a pantry and a bathroom. The Construction Department of the Commonwealth Edison Company did the wiring, and special permission was obtained from the Department of Gas and Electricity of the City of Chicago, for the present *Rules and Regulations* of the Department do not sanction wiring of this character. This building is the first in Chicago to be wired by the concentric-wiring method.

The building has been wired for a total of 20 lighting and two wall-switch outlets for 24 lamps. Complying with the requirements of the City Department of Gas and Electricity, two circuits for each flat were installed. This is based on the rule that the wiring shall provide a capacity for three-quarters watt per square foot of floor space in apartment buildings.

Fig. 2 is a sketch of the wiring plan in the basement. Fig. 3 indicates the wiring of the first-floor flat and Fig. 4 that of the second-floor flat.

Figs. 5 to 8 illustrate portions of this concentric-wiring installation and reveal the neat and workmanlike appearance presented by the completed job. Fig. 5 shows the service entrance in the basement with the meters and meter-protective devices for the two flats. A view in the living-room is shown in Fig. 7. This illustrates the method of switch control for a ceiling outlet; also the branch block from which wiring is continued to the ceiling outlet in the hall or vestibule. The fixture in the hall is shown through the open doorway at the right in Fig. 7. A view in the bathroom is given in Fig. 6. In making this picture the camera was pointed toward the ceiling, and a bend in the concentric wiring is illustrated clearly. Fig. 8 shows the wiring in the kitchen with a wall outlet for an electric flat-iron.

Each of the flats was wired for seven ceiling outlets, one baseboard outlet, one wall outlet and one wall-switch. The

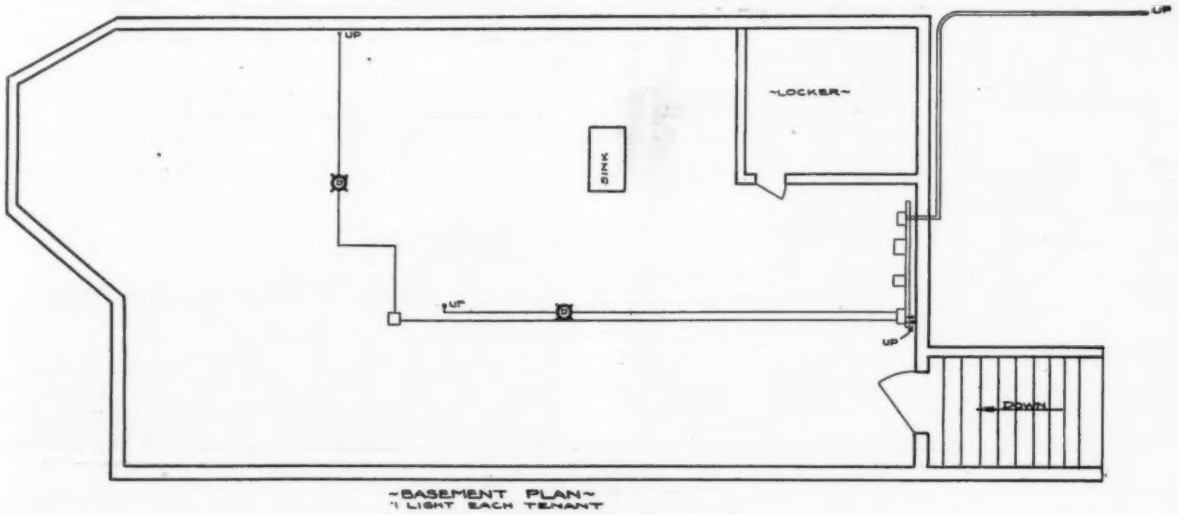


Fig. 2.—Wiring Plan for Basement.

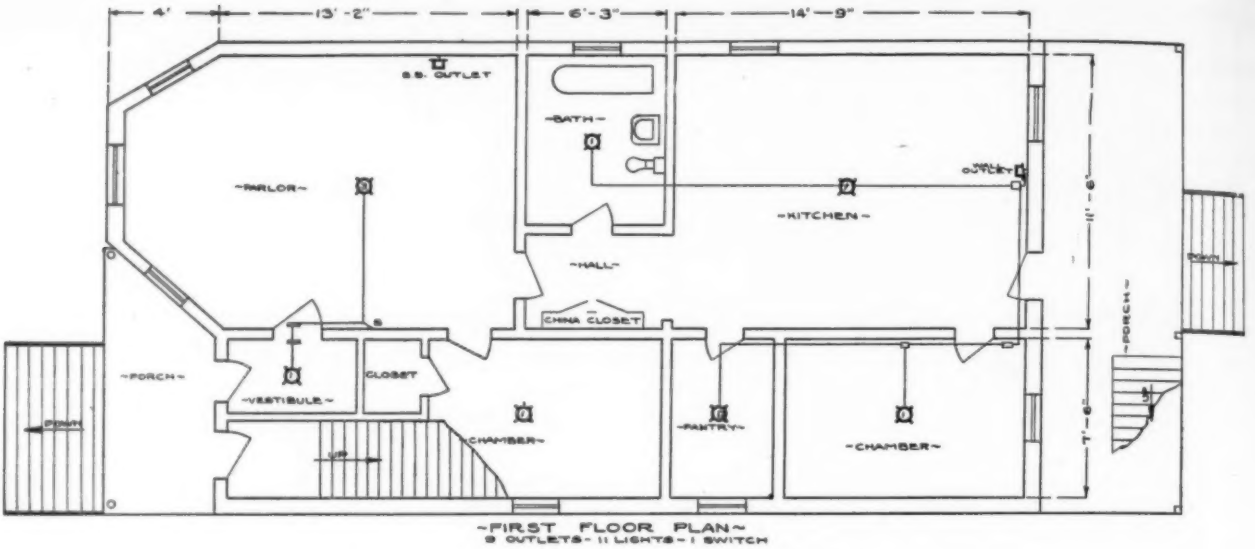


Fig. 3.—Wiring Plan for First Floor.

total number of lamps in each flat is eleven. There are two outlets and two lamps in the basement. Distribution of outlets, switches and lamps, for each meter, was made according to the following table:

Location	Ceiling Outlets.	Baseboard Outlets.	Wall Outlets.	Wall Switches.	Number of Lamps
Hall	1				1
Parlor	1	3	1	1	4
Front bedroom	1	1			1
Rear bedroom	1	1			1
Kitchen	1	1	1		2
Pantry	1				1
Bathrom	1				1
Basement	1				1
Total	8	1	1	1	12

The cost of the material used for this wiring job was as follows:

Material (concentric)	$28.23
Material (standard)	3.18
Material (service)	7.49
	$38.90

The labor used on this job amounted to 83.5 hours divided into 33 hours of the wireman's time and 50.5 hours of the helper's time. The cost of the fixtures used was $39.86, the remaining item of cost being $0.84 for carfare and expenses. The amount of concentric wire used was 345 feet.

It was found that the job had cost more than would have been the case if the wiring had been done under the present practice using flexible metallic conduit and armored cable. The same job was figured on this basis, and the material came to $24.73, with 66 hours of labor, divided into 33 hours of the wireman's time and 33 hours of the helper's time. The fixtures and the carfare and miscellaneous expense would be the same in both cases.

It is not thought strange that the first interior wiring job using the concentric wiring method should cost more than the older and well established method. The cost of concentric wiring is bound to decrease after the wiremen become more familiar with the use of concentric materials. Further, it is evident that where a number of completed buildings are to be wired, larger quantities of material will be ordered, and naturally a better price for material will be secured in view of the quantity required. With more experience in this class of work, it is, of course, to be expected that the hours of labor per job will be substantially reduced. Again, as will be observed by reference to the pictures, the quality of fixtures used is rather better than might be expected in an installation of this character. The cost of the fixtures has nothing to do with the comparative cost, however, for the same amount is given in each case; but the use of simpler fixtures would reduce the total cost. One man who has given considerable attention to the sub-

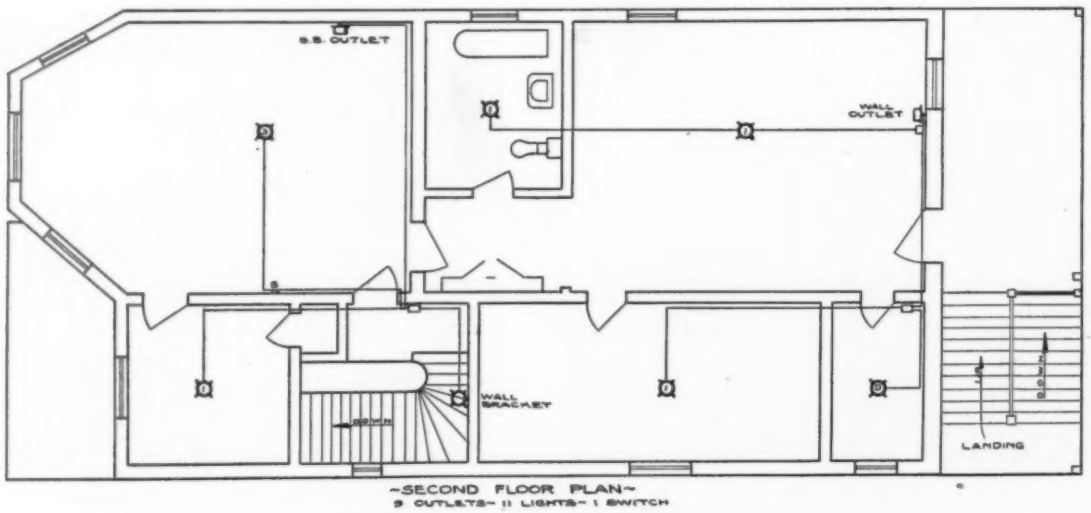


Fig. 4.—Wiring Plan for Second Floor.

Photographs Courtesy Commonwealth Edison Co.

Fig. 5.—Service Entrance in Basement.

Fig. 6.—Fixture in Bathroom.

ject believes that when large quantities are used the cost of concentric material will be reduced at least 25 per cent below the present figure, while he thinks that when the workmen get accustomed to handling the concentric wire the labor cost will be about one-third of the labor cost on this experimental installation.

Concentric Wiring to be Demonstrated at New England Convention.

A section of a cottage house, with wiring and fittings installed on the Stannos or concentric system, will be exhibited at the annual convention of the New England Contractors' Association, to be held at Hartford, Conn., the coming September. The wire used will be about three-eighths-inch in diameter, composed of No. 14 copper with reinforced insulation and tinned copper sheath. Metal clips will be used to secure it in position.

In an announcement issued from the headquarters of the association in Boston, the following attitude toward the concentric system is set forth:

This concentric wiring is used extensively in many of the large cities of Europe, and it is also quite extensively used in many of our Western cities. It is a universal opinion of electrical men whom the writer has had conversation with regarding this wire that the extra amount of labor required to make a neat and attractive job more than compensates for the difference in the cost of material.

In concrete factories and cellars where the attractiveness of the installation is not essential, this wire has its advantages. It is only a few years since the introduction of flexible armored cable. At first, it was looked upon with suspicion by the Underwriters, and they very reluctantly permitted its use. Today it is not only approved, but its use is advocated in preference to almost any other form of construction with the exception of galvanized iron conduit.

Although the cost of the concentric wire is practically the same as "BX," it is only being made at present on special orders, and it is only reasonable to suppose that if the use of this wire were to become general and the demand for it increase, the price would be considerably less than at present.

Why One Contractor Does Not Bid on Competitive Jobs.

An electrical contractor in a Western city has given practical evidence of his sincerity in respect to the evils of competitive bidding, by adopting a policy of disregarding absolutely all prospective orders in which price is a feature.

"What's the use of doing work just to keep busy?" he asks. "I have made plenty of money on competitive work and good-sized contracts, but since so many contractors have been bidding low just to keep busy, there has been no money in such jobs. Naturally a job taken at a low competitive price can't be given the service that should go into it, if the bidder expects to get out alive. And self-respecting contractors aren't going to slight a job, even though they have to skim close to the price of doing it. There are enough builders and architects who look first to service, to keep me going, men who know they will get honest value for the money they pay for electrical service. In the long run I will have a larger net profit, and perhaps a better reputation, even if I don't do quite so great a volume of this class of business.

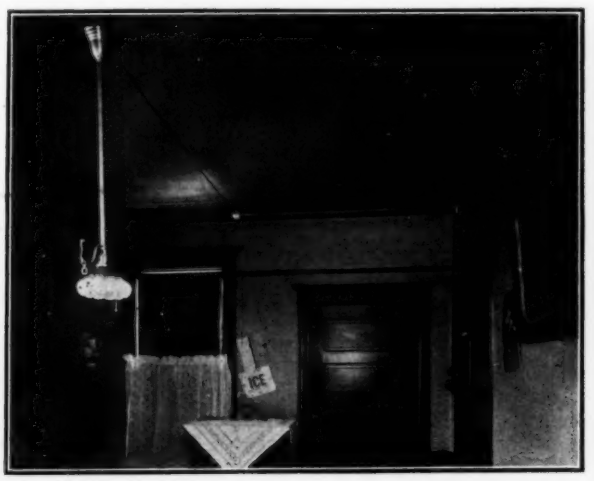
"And I will not feel that I am helping to demoralize the electrical industry."

Large Percentage Pass Journeymen Examination in Massachusetts.

Thirty-eight candidates for certificates as masters or journeymen electrical workers took the examination required by Massachusetts law, at Fall River, July 6. Of the whole number, 32 passed the test, which was the largest percentage in any similar examination held thus far in the state.

Photograph Courtesy Commonwealth Edison Co.

Fig. 7.—Living Room of Chicago Residence Equipped with Concentric Wiring.



Photograph Courtesy Commonwealth Edison Co.

Fig. 8.—Kitchen of Chicago Residence Equipped with Concentric Wiring.

Polyphase Motor Windings—II

By Justin Lebovici

In this article polyphase windings of different types are being taken up. The consideration of closed two-layer wave windings was begun last week and is here continued. Numerical examples are worked out and illustrated. Future installments will deal with single-layer windings and windings for two speeds. Special attention is given to the mechanical design of the windings.

The details of wave windings can most readily be studied by a consideration of a concrete example such as the following.

Example No. 4.

Assume a four-pole armature having 9 slots, 9 commutator bars, and two circuits, in a four-pole field. Two brushes are placed on the commutator, spaced one-fourth of the commutator circumference.

We have

$p=2 \quad a=1 \quad K=9 \quad Z=9 \quad S=2\times9=18$

(1) For a progressive winding $y=y_1+y_2=(18+2)/2=10$

$y_1=5$

$y_2=5$

$y_k=(9+1)/2=5$

(2) For a retrogressive winding $y=y_1+y_2=(18-2)/2=8$

$y_1=5$

$y_2=3$

$y_k=(9-1)/2=4$

We have selected $y_1=5$ and $y_2=3$ as this makes the forward throw nearer full pitch.

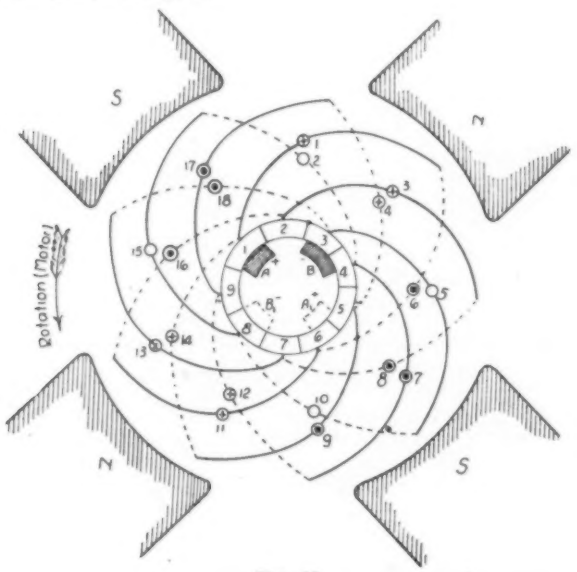


Fig. 12.

Table IV and Fig. 12 represent the progressive winding, and Table V and Fig. 13 the retrogressive winding.

TABLE IV.

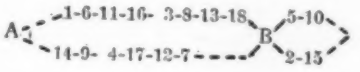
Commutator Segment.	Conductor.	Conductor.
1	1	6
2	3	8
3	5	10
4	7	12
5	9	14
6	11	16
7	13	18
8	15	2
9	17	4

TABLE V.

Commutator Segment.	Conductor.	Conductor.
1	1	6
9	17	4
8	15	2
7	13	18
6	11	16
5	9	14
4	7	12
3	5	10
2	3	8

Assuming that a direct current enters at brush A and leaves at brush B, the direction of the current in each conductor is indicated by dots and crosses in Figs. 12 and 13.

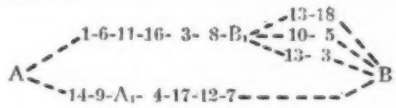
The path of the current in Fig. 12 is as indicated below:



The current is distributed equally between two circuits; hence the name of two-circuit or wave winding is commonly given to this type of winding.

It will be noted that, independently of the number of poles, the number of brushes can be reduced to two, which is a great advantage in some types of single-phase commutator motors, in which, if a lap winding were used, the number of brushes would have to be equal to the number of poles.

The brush B short-circuits coils 5-10 and 2-15. Additional brushes A_1 and B_1 may be placed on the commutator, as shown by the dotted lines, without materially affecting the distribution of current around the armature. The distribution of current is then as follows:



It will be noted that the number of coils in series short-circuited by one brush is reduced, which is a very important factor in commutator machines.

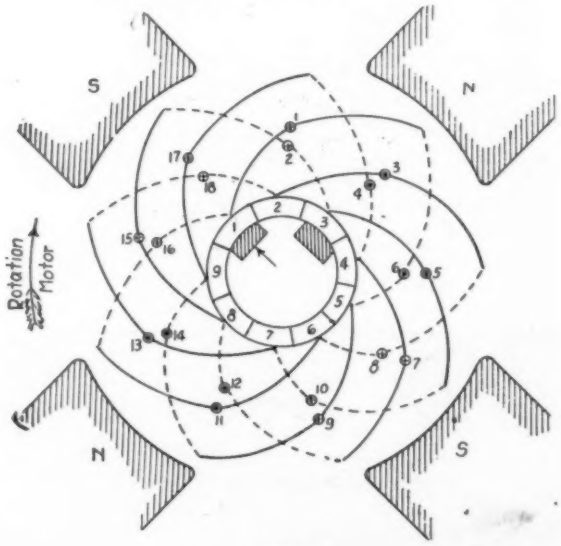


Fig. 13.

It follows then that in a two-circuit winding the number of brushes may be made equal to the number of poles, but that any number of pairs of brushes can be left off, so long as one pair is retained.

In case the number of brushes is reduced, the brush area has to be increased proportionally, since, in the example above, with two pairs of brushes the current enters the armature through brushes A and A_1, and with only one pair of brushes the current enters through brush A only.

In following the conductors around the armature in Fig. 12, we return to the starting point after having touched every

conductor, and this winding is called a *simplex wave* winding.

Applying Fleming's "left-hand rule" to Figs. 12 and 13 we notice that with the same field and current entering the brushes in the same direction, the armature shown in Fig. 12 will rotate to the left and the armature shown in Fig. 13 will rotate to the right.

Example No. 5.

Assume a six-pole armature having 28 slots, one coil per slot, and 14 commutator bars, connected to form a two-circuit progressive winding, placed in a six-pole field and driven in a clockwise direction. See Fig. 14. We have:

$p=3 \quad a=1 \quad K=14 \quad Z=28 \quad S=28 \quad y_n=1$

$y=(S+2a)/p=(28+2)/3=10$

$y_1=5 \quad y_2=5$

$y_n=(K+a)/p=(14+1)/3=5$

We would specify this winding by stating that *the coil lies in slots* 1 *and* 6 *and connects commutator bars* 1 *and* 6. Table VI and Fig. 14 show this winding.

TABLE VI.

Commutator Bar.	Conductor.	Conductor.
1	1	6
2	3	8
3	5	10
4	7	12
5	9	14
6	11	16
7	13	18
8	15	20
9	17	22
10	19	24
11	21	26
12	23	28
13	25	2
14	27	4

As shown above, two brushes spaced $(K+a)/2p=15/6=2.5$ commutator bars apart are sufficient to introduce or collect current from the winding. The conductors indicated by a solid

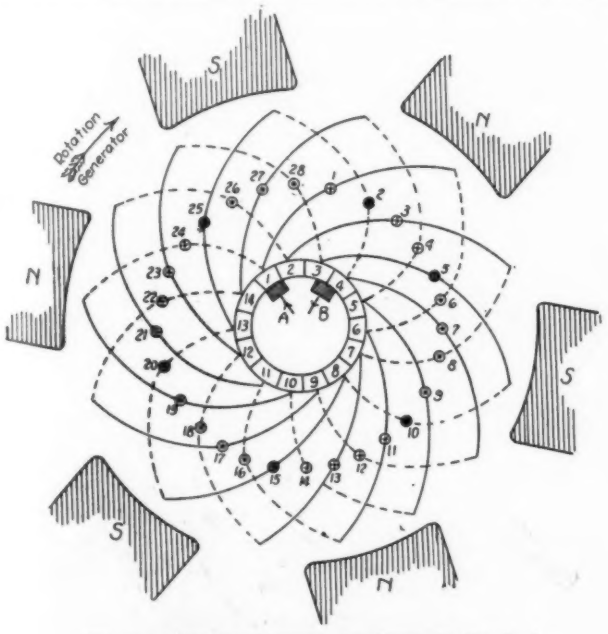


Fig. 14.—Winding Diagram for Example No. 5.

black circle are short-circuited by brush *B* and are detrimental to a satisfactory performance of the machine, as will be discussed later.

Two-Circuit Wave Winding the Equivalent of a Two-Pole Ring Winding.—Referring to the lap or multiple winding shown in Fig. 10, it is at once evident that we can, without making any change in the diagram, connect the ends so as to form a ring winding and not change the characteristics of the winding. The winding will still be a four-pole winding with the same number of paths in parallel as there are poles.

A two-circuit wave winding can likewise be replaced by a ring winding, but the equivalent ring winding will be a two-pole ring winding independently of the number of poles in the winding it replaces. This can be seen by a study of Fig. 14. We note that in conductors 3 and 8, for instance, the generated electromotive forces are displaced in phase by the same angle as the coil pitch y_1 differs from the pole pitch τ, or by an angle $y_1-\tau=m_1$. No change would be produced, therefore, if we place conductor 8 near conductor 3, as shown in Fig. 15, provided we connect the rear end of 3 to the front end of 8 (instead of connecting the rear end of 3 to the rear end of 8) and make the distance between 3 and 8 equal to

$$m_1=(S+2a)/2p-S/2p=a/p$$

The distance between two conductors in the equivalent diagram, Fig. 15, is equal to $a/p=1/3$ the distance between two

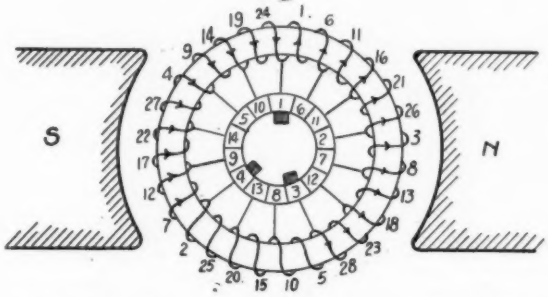


Fig. 15.—Ring Winding Equivalent To Wave Winding.

conductors in the original diagram. Repeating this operation for each bar we obtain the two-pole ring winding which is the equivalent of the six-pole two-circuit winding of Fig. 14.

We have shown above that a drum winding can be replaced by equivalent ring winding and, since the ring winding is simpler and easier to follow than a drum winding, we may limit our theoretical discussions in the future to ring windings only and know that our deductions apply equally well to the drum windings in common use.

Multiplex Windings.

Examples 1 to 5 were so chosen that if we started with any one conductor on the armature surface and followed the equivalent ring winding we returned to the starting point after having gone once around the armature. By selecting a field displacement, *m*, equal to any whole number greater than one in the case of a lap winding, or by selecting the number of parallel circuits such that half the number of circuits is any whole number greater than one, we obtain windings characterized by the fact that it is necessary to pass more than once around the armature before we return to the starting point.

Fig. 16.—Simplex Winding.

Fig. 16 represents the *simplex* winding. Starting at any point *A*, we return to *A* after having followed the conductors once around the armature or ring.

In Fig. 17 if we start at *A*, we return to this point after having gone once around the ring, but we have touched only half the conductors. Starting at *B* we touch the remaining half of the conductors by going once around the ring. Such a winding is called a *duplex* winding, and since we have two complete windings we call the winding *doubly re-entrant.*

Fig. 17 illustrates a duplex doubly re-entrant winding. Similarly we may have *triplex, triply re-entrant* windings, or in general, *multiplex, multi re-entrant windings.*

Starting at *A*, Fig. 18, we return to *A* after having gone twice around the ring, and such a winding is called a *duplex singly re-entrant* winding, since we must go twice around the ring and there is but one complete winding. Similarly we may have a *triplex, singly re-entrant* winding, or in general a *multiplex, singly re-entrant* winding.

We may move any number of times around the ring and have any number of re-entrances, e. g., a quadruplex winding, doubly re-entrant, in which we would go four times around the ring but would have only two re-entrances.

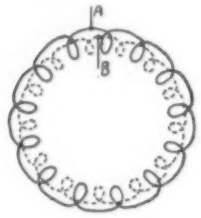


Fig. 17.

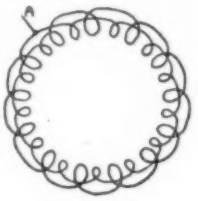


Fig. 18.

The number of re-entrances is equal to the common divisor of y_R and K, and the winding is singly re-entrant only when y_R and K have no common divisor. This may be explained as follows.

From equation (9) $y_R=(K\pm a)/p$.

A multiply re-entrant winding may be considered as made up of several singly re-entrant windings, or, if we assume the number of re-entrances equal to g we can write

$$gy_R=(gK\pm ga)/p \qquad (15)$$

and the number of re-entrances is equal to the common divisor, g, of y_R and K.

The above discussion will now be illustrated by several examples.

Example No. 6.

Assume a four-pole, lap winding, having 16 slots and 16 commutator bars. The number of circuits is to be equal to twice the number of poles. The coils are form-wound and the winding retrogressive. We have

$Z=16$ $K=16$ $S=2\times16=32$ $p=2$ $a=4$ $y_R=S/Z=32/16=2$

Since the coils are to be form-wound we must fulfill equation (14), or

$$y_1=(\text{whole number})y_R+1$$

and y_1 must also be approximately equal to τ.

$\tau=S/2p=32/4=8$

From (14) $y_1=3\times2+1=7$

From (12) $y=y_1-y_2=\pm2m$

From (7) $a=mp$ or $m=a/p=4/2=2$

$y=-4=7-y_2$

$y_2=11$

From (13) $y_R=\pm m=-2$.

Since y_R and K have the common divisor 2, the winding will be *doubly re-entrant* and since it is a lap winding with $m=2$

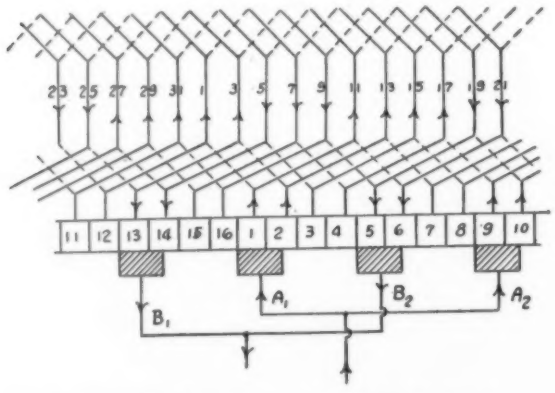


Fig. 19.—Winding Diagram for Example No. 6.

we will have a *duplex winding.* Accordingly the above winding will be a *duplex, doubly re-entrant, multiple* winding.

Table VII and Fig. 19 give a complete layout of this winding. For shop specification it is sufficient to state that *the coil lies in slots* 1 *and* 4 *and connects commutator bars* 1 *and* 15.

TABLE VII.

$y_1=7$. Commutator Bar.	Conductor.	$y_2=11$. Conductor.
1	1	8
15	29	4
13	25	32
11	21	28
9	17	24
7	13	20
5	9	16
3	5	12
2	3	10
16	31	6
14	27	2
12	23	30
10	19	26
8	15	22
6	11	18
4	7	14

Comparing Tables VII and II it will be noted that in this winding the difference between two horizontal lines is equal to m in the commutator-bar column and equal to $2m$ in the conductor column. We also note that, starting at commutator bar 1, we return to the starting point after having touched only half the bars, and since the winding is *doubly re-entrant* we must start again with commutator bar 2 and go around the armature once more before we have touched all the bars. If each conductor is to receive current, the number of brushes

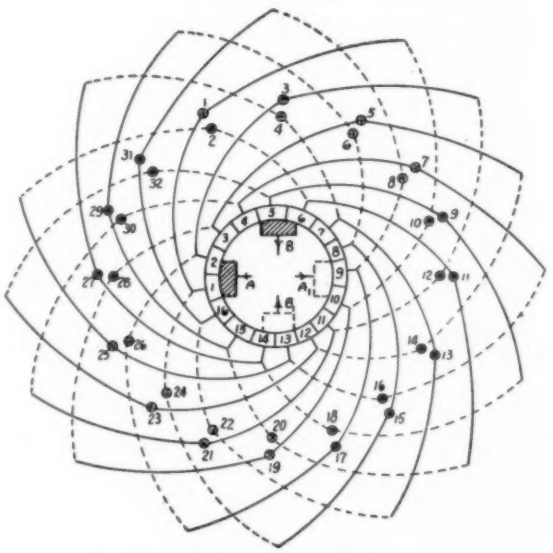
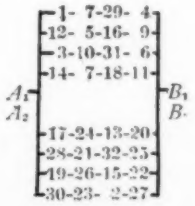


Fig. 20.—Winding Diagram for Example No. 7.

must equal the number of poles, and a brush must also be wider than a commutator bar, as can be seen by tracing through Fig. 19. In Fig. 19 one circuit is represented by full and the other circuit by dotted lines. The paths of the currents in Fig. 19 are as follows:



Example No. 7.

Assume a four-pole armature with 16 slots and 16 commutator bars. Lay out a duplex wave winding, using form-wound coils. We have

$Z=16$ $K=16$ $S=32$ $p=2$ $a=2$ $y_R=32/16=2$

From equation (8) $y=y_1+y_2=(S\pm2a)/p=(32+4)/2=18$

From equation (14) $y_1=4y_n+1=8+1=9$
$y_2=9$
From equation (9) $y_n=(K+a)/p=(16+2)/2=9$.
Since y_n and K have no common divisor we will have a *singly re-entrant* winding and we have, therefore, *a duplex, singly re-entrant, progressive wave winding.*

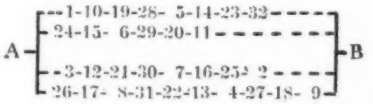
Table VIII and Fig. 20 fully describe this winding. For shop specification however, it is sufficient to state that *the coil lies in slots* 1 *and* 5 *and connects commutator bars* 1 *and* 10.

TABLE VIII.

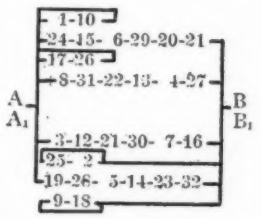
Commutator Bar.	Conductor.	Conductor.
1	1	10
3	5	14
5	9	18
7	13	22
9	17	26
11	21	30
13	25	2
15	29	6
10	19	28
12	23	32
14	27	4
16	31	8
2	3	12
4	7	16
6	11	20
8	15	24

Comparing Tables VIII and VI we see that in this case the difference between two horizontal lines in the commutator-bar column is equal to a and the difference between two horizontal lines in the conductor or coil-side columns is equal to $2a$. From a consideration of Fig. 20 it will be seen that the number of brushes may be reduced to two independently of the number of poles, and that each brush must cover at least a commutator segments.

The paths for the currents in Fig. 20, with the number of brushes reduced to two, is as follows:



If brushes A_1 and B_1 (dotted in Fig. 20) are added, the distribution of current is as follows:



We see that by increasing the number of brushes to equal the number of poles, the distribution of current is made more uniform. The coils 1-10, 17-26, 25-2, 9-18 are short-circuited.

We may now draw a ring winding equivalent to Fig. 20 using the same method as in determining Fig. 15. Since the number of circuits $=2a=4$ we see at once that the equivalent ring winding will be a four-pole winding. In general, the equivalent ring winding will have $2a$ poles.

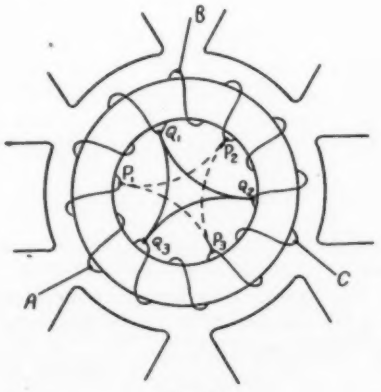


Fig. 21.

Equipotential or Equalizing Connections in Closed Windings.

Fig. 21 represents a six-pole ring winding having four coils for each pair of poles. It has been previously explained that the potential diagram for parts AB, BC, and CA may be represented by identical circles or polygons inscribed in the circles. For a distributed winding we would have, as potential diagrams, three circles of equal diameters (in Fig. 22 the three circles are drawn concentric and of different diameters). Three points, such as P_1, P_2, and P_3, having the same potential, can evidently be permanently connected together, and likewise the points Q_1, Q_2, and Q_3, can be permanently connected. Such connections are called equipotential connections. These connections carry no current so long as the machine is perfectly symmetrical, but will carry heavy currents, which react on the field and correct the disturbance, as soon as the unavoidable unsymmetries occur.

The points that can be joined by these equalizing connections, in the case of a lap winding, lie $y_p=K/p$ segments apart or $y_p=S/p$ conductors apart.

A wave winding being the equivalent of a two-pole ring winding, the points that can be connected by the equalizing connections lie $y_p=K/a$ commutator bars or S/a conductors apart.

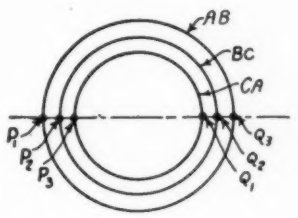


Fig. 22.

Fig. 23.

In order to avoid heavy currents flowing through these connections it is necessary that K/a and Z/a be whole numbers.

Example No. 8.

We have a six-pole lap-wound armature having 54 slots and 54 commutator bars. We desire to apply equalizing connections to every ninth commutator bar. We have

$$y_p=K/p=54/3=18$$

and the connections will be as follows:

1-19-37- 1
7-25-43- 7
13-31-49-13

The commutator and equalizing connections are shown in Fig. 23.

(To be continued.)

Among the Contractors.

The contract for the electrical construction work on the new electric lighting system to be installed in Westport, Ind., has been placed with Barringer & Tumulty, of Greensburg, Ind.

The Fritz & Hillmer Electric Company, of Carroll, Iowa, has sold its stock and business to the Leyser Electric Company, of the same place.

The contract for the electrical work in the new industrial school building in Gilbert, Minn., has been awarded to William Tritchler, of Virginia, Minn.

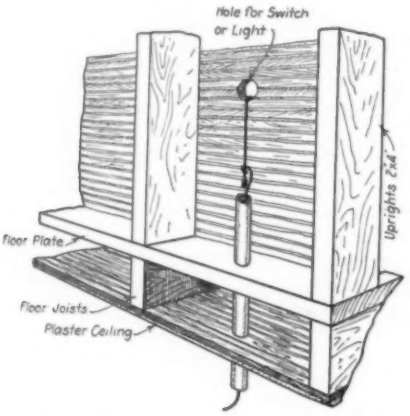
The Squire Electric & Construction Company has moved to 401 Wyandotte Street, Kansas City, Mo., where the larger quarters, more than 3,000 square feet, and the substantial building, will better accommodate the equipment for large repair work. A basement of equal size to the main floor contains the company's power plant and shop. The Squire company will not be so actively in the contracting business, except on open orders.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing Through Two Floors.

In fishing, where it is necessary to cut through a plastered ceiling and then up through a floor it is often a hard matter to catch the string with a weight on the end,



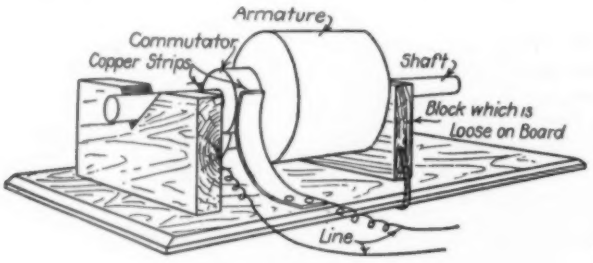
Method of Fishing Through Two Floors.

as it is not easy to fish through the two holes. I use a small pieces of brass tubing as shown in the accompanying illustration. This is easily carried in the tool bag, as it is about 14 inches long and five-eighths inch in diameter. The method of use is indicated in the diagram.

Carl M. Newman.

Testing Small Armatures.

The usual way of testing an armature requires two persons, one to hold the leads on the commutator while the other watches the indicating instrument. By using the device illustrated herewith I obviate the necessity for a helper. This device consists of a board 15 by 5 inches, upon which two small V-blocks are mounted. One of these is nailed securely to the front end, while the other is adjusted for the length of the armature. Two strips of



Device for Testing Armatures.

spring copper are nailed to the board about three-quarters inch back of the front V-block. The armature to be tested is set between the copper strips on the V-blocks, and the leads are connected to these copper strips with an incandescent lamp in series.

John P. Vins.

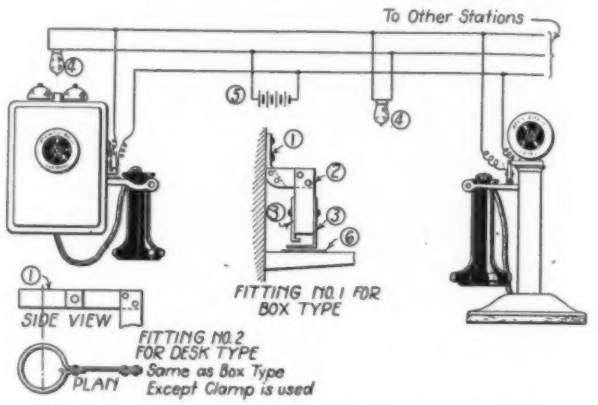
Channeling Hollow-Tile.

In the May 27, 1916, issue of the REVIEW, J. B. Story gave a description of a scheme to channel hollow tile by making a series of holes the width of the piece of tile to be removed. I do not make the series of holes, but instead use a sharp cold chisel and I can make a clean cut of the desired width by going over each side with the chisel. I find this a time saver on close-competition contract work.

M. J. Moriarty.

Telephone Signal.

The accompanying diagram shows how a visual signal was arranged to show when any telephone upon a certain private line was in use. Ordinarily it is necessary to lift the receiver and listen to tell whether another party is on the line. By using the pair of contacts shown in the



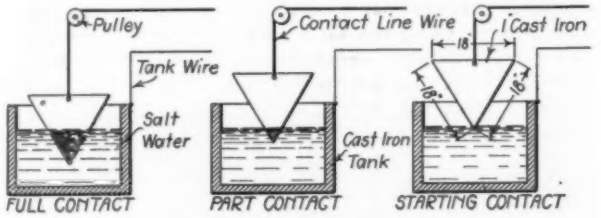
Visual Telephone Signal.

diagram, the lifting of any receiver will close a circuit which lights the lamps indicated by 4, thus showing that the telephone line is in use. The fitting has been adapted for both the desk type and the wall type of telephone. The strip of brass represented by 1 is about four inches long, one-quarter inch wide and one-sixteenth inch thick. 2 is a piece of fiber one-quarter inch square and one inch long, drilled and tapped for a 6/32 screw. 3 represents two pieces of flexible tin one-quarter inch wide and of different lengths as shown. 6 represents a small piece of mica which is glued to the receiver hook to prevent contact with the telephone instrument.

Walter Morris.

Water-Rheostat Plates.

When using a water rheostat I find it advantageous to shape the contact plates as shown in the diagram. With the triangular shape I get a greater range in resistance



Water-Rheostat Plates.

than is possible with a rectangular plate, and moreover the variation of resistance is more even when the plate first enters the liquid. The flexible contact wire can be drawn over a wooden pulley as shown and serves to adjust the position of the plate.

M. J. Moriarty.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

TURNING BOOK ACCOUNTS INTO CASH.

Experience of an Electrical Dealer Who Was Forced to Make His Collections in Order to Save His Business.

By J. S. Vogel.

Book accounts, good, bad and indifferent, are a thorn in the flesh of many electrical dealers. To force collections and at the same time retain the good will of customers is a problem that is not easy to solve. A dealer in southern Illinois faced this situation and solved the problem to his own satisfaction.

Most of this dealer's business came from people who owned their homes or were in business for themselves, and, while good credit risks, they were slow in paying their bills. The dealer himself did not want to make collections, but he occasionally sent one of his clerks out to do that work. But the clerk was not a collector and about the only good he did was to personally deliver a statement to the customer, taking the money when it was offered him, but never definitely asking that a bill be paid. This condition of affairs was unsatisfactory and finally reached its climax when the dealer himself was unable to meet his bills.

Under these conditions it was only natural that he should complain of the fact to the salesman from whom he purchased most of his electrical goods. The salesman knew that the dealer was reliable, but that of late he had not been paying his bills promptly. When the salesman handed the dealer a statement furnished him by his house, he did so with an apology, saying that it was merely a matter of form, that the credit manager did not know existing conditions, etc., etc.

But the dealer realized the justice of the claim and was not offended by the salesman. Also, he knew that the salesman was afraid of offending him. Instead of asking him for the money due, the salesman really as much as told him not to pay the bill until convenient. After a moment's consideration, the dealer turned to the salesman-collector and said: "You're about as poor a collector as that man of mine. You're afraid to ask for money that is rightfully yours."

Then followed the explanation. The result was that the salesman agreed to talk over the problem with other dealers and with the credit man of his house, in the hopes of finding some method that would enable the dealer to collect his money and at the same time retain the good will of his customers. That evening the salesman wrote a long letter to his credit manager, telling him in detail the exact conditions, and asking that he find some method to help the dealer, who was a good customer. It was the credit man's duty to collect money due his firm—and he had the reputation of knowing how to do it. For that reason the salesman appealed to him. The result was that the next time the salesman called on the dealer he had a definite plan to suggest. To collect the outstanding accounts from good customers he suggested that the following letter be mailed about one or two days before the clerk called to collect the account:

Dear Sir:

One of my clerks, Mr. ....., occasionally acts as my collector. But when collections are a little poor he becomes downhearted and dejected.

He is a good man otherwise and I like to help him along. For this reason I sometimes slip in a few easy accounts to encourage him.

Today I slipped in your statement among the others, as I know that when he calls you will accommodate him with a check for the amount of the statement.

Thanking you in advance, and awaiting your further orders, I remain,

Yours very sincerely,

There is nothing in this letter to offend a customer, and at the same time it is a letter strong enough to produce results. This letter, on the electrical dealer's stationery, will produce more actual results than if letters were mailed out threatening to place the accounts in the hands of an attorney.

Another letter suggested by the credit man was very effective in getting cash from outlawed accounts and professional dead-beats. In fact, it collected accounts that had previously been in the hands of an attorney without results.

The second letter, while short, goes straight to the point, as you can see from the following:

Dear Sir:

Your account, amounting to $....., has long been overdue. Unless this is paid, or definite arrangements made for future payment by (date, about 5 days), we may take action of a sort that will GREATLY SURPRISE YOU.

Very sincerely yours,

The feature that stands out most strongly in this letter is the element of mystery. The man who gets the letter begins to think of all the things that might happen to him if he does not pay his bill—and he usually pays.

It will be noted that this letter does not make a definite threat. It simply says "we may," but it says so in such a manner that the reader infers that such action is to be taken. For the collection of old accounts—those that have long been outlawed and given up for lost—it may pay to try this letter. If there is any possible manner of getting the money, this letter should bring it. At any rate, by a trial there is nothing to lose and everything to gain.

Providence Central Station Enlarges Electric Shop.

The Narragansett Electric Lighting Company, Providence, R. I., has doubled the size of its electric shop, which is located on the ground floor of the Turk's Head Building, the executive and business offices being on the eighth floor of the same building.

The enlarged store is 40x60 feet, with two large show windows, and there is a small mezzanine floor or gallery over one corner, used by the head of the appliance department as his office.

All the interior woodwork in the store is solid mahogany, and the window curtains are of maroon-colored velour. A distinctive feature is the provision for the display of table lamps, of which a very large assortment is carried.

At the floor level along one wall of the room are continuous glass fronted cabinets about 30 inches high and 30 inches deep. These provide for the display of silk shade lamps, while a part of the top of the cabinets is used for the display of smaller appliances.

A Corner of the New Providence Electric Shop.

Above the cabinets are three shelves, each one partitioned into separate compartments holding one lamp. Partitions are of a single board covered with velour and set in place without any mechanical device, thus allowing it to be changed, so as to provide for lamps of varying sizes. About 80 table lamps can be displayed in these individual racks.

The inclosed cabinets are lighted with 25-watt 125-volt tubular lamps in showcase reflectors, the light green compo board background furnishing an excellent setting for the lamps displayed. The lamps on the shelves are all connected to circuits, thus being lighted as desired.

A new appliance store of the Narragansett Company at East Greenwich, R. I., is on the same pattern. In fact, all the company's stores are equipped with interchangeable counters and shelves of the same kind of wood. A large quantity of velour cloth of various colors is kept on hand for show window decoration. It is the policy to make frequent changes in window displays, taking advantage of weather conditions, holidays, public events, etc.

An Attractive Arrangement of Shelving for Displaying Lamps and Reflectors, Providence Electric Shop.

the display of specialties likely to be in popular demand. During the hot weather fans of various types, and in cool days of early autumn, electric radiators, are the appropriate displays at these times. The table stands just front of the cashier's cage and the service application desk, and sells goods without human help.

The opening day of the new Shop, July 13, being "Dollar Day" in Providence, the company featured a "Tiptop" portable lamp, with parabola shade, at $1, selling about 600. July 31 was a great day for fans, this being at the height of the "hot spell." An 8-inch fan was featured at $5.50, and a large number sold. In fact, fans of all makes and types were snatched up by eager purchasers as fast as they could be brought from the store room.

About August 15 a display of washing machines will be put in the show windows. On one side will be a negro "mammy" doing the family wash after the time honored fashion, while in contrast will be a modern laundry, electrically equipped, with the housewife seated by in coolness and comfort.

A. H. Allcott, who is in charge of the Electric Shop in Providence, also has charge of three suburban shops, in East Greenwich, Bristol and Arctic, besides two minor offices. E. R. Davenport, the company's sales manager, takes pride in pointing out that the company does not do business in its lamp and appliance department for the love of doing business, or merely as an adjunct to the light and power business. Unlike many central-station companies, the Rhode Island concern makes a profit on all sales, as most business houses like to do.

Large Domestic Sale at Waltham, Mass.

The Boston Edison Company's Waltham manager, W. J. Gaffney, recently sold to one customer for his household use what is perhaps the largest sale ever made to a single customer in Boston. It consisted of a 10-kilowatt range, washing machine, motored mangle, 4 electric irons, silver plated toaster, samovar, coffee urn, egg boiler, hot-water kettle, grill, sewing machine motor, electric oven and vacuum cleaner. It is also reported that an electric refrigerating equipment will also soon be installed by this customer.

Low-Priced Combination Fixture Set Offered in Boston.

A Boston jobbing house is offering a complete set of electric fixtures for a seven-room house at the low price of $14.25. The set includes a living-room shower, $4.00; dining-room semi-direct bowl, $4.85; kitchen pendant, $0.90; bathroom bracket, $1.00; three bedroom brackets at $1.00 each, and a porch light at $0.50.

Electric Fixtures $14.25
FOR 7-ROOM HOUSE. COMPLETE
(We have other sets up to $150)
Living Room Shower
$4.00
Dining Room Semi-Direct
$4.85
Kitchen Pendant
90c
Bathroom Bracket Porcelain Socket
$1.00
3 Bedroom Brackets $1.00 each, or $3.00 complete.
Porch Light
50c
This set is just one example of the great values we are able to offer in all kinds of Electric Fixtures. Hundreds of Domes, Showers, Semi-Direct Bowls in real alabastine and art glass to select from. Write, tel. or call.
FARLEY & MacNEILL
"The Big Value Fixture House"
98 FEDERAL STREET

Newspaper Advertisement Announcing Sale of Low-Priced Fixture Sets.

Making Dealer's Collections in the Summer

An Interview with R. H. Edwards, Manager of the Edwards Electric Company, Denver, Colo., on Summer Collections for the Electrical Dealer

DURING the summer months and early in the fall collections are very apt to be slow and as a result they need a good deal of attention on the part of a man engaged in the electrical merchandising business," says Robert H. Edwards, manager of the Edwards Electric Company, 137 Fifteenth Street, Denver, Colo. "In fact, a dealer has to keep continually on the jump in looking after his collections or he is going to get into trouble later on in the year.

"During the summer months and far into the fall people are busy taking vacations, going to amusement parks and baseball games, riding about the country in their automobiles, and the like. Now all this takes money, and the people are very apt to forget they owe bills that must be paid, or if they do remember them they want to let them slide with a remark something like this: 'Oh, well, we can attend to that bill after the summer is over. We need our money for other purposes now and can better spare it later on in the year.' That may settle the case with them, but it does not do so with the electrical merchant. He has to have money to run his business in the summer just the same as any other part of the year. So it is up to him to get busy and get it. If he does not, several payments will come together with the 'slow pays' and it will be a difficult matter for some of them to get caught up again.

"We make a big effort in the summer to get payments when they fall due as nearly as we possibly can. We find it pays and saves us a whole lot of work when the summer vacation season is over. Of course, we find a number of people that stand off payments at this time of year, but we are glad to report that collections are much better at our store just now, and have been during the summer, than they would have been had we not made an extra effort in collecting bills when they fell due. Also, in some departments of the electrical business, trade falls off during the summer and so a dealer is given that much more time to look after his collections. No stone should be left unturned in keeping payments up to date during the hot months of summer, and when winter comes a dealer will be able to direct all his energies to the business then in hand and he will not have to spend time, worry and money in going out after bills that should have been paid during the summer."

It was pointed out that to be successful in the electrical merchandising business it is necessary to watch collections very closely, not only in the summer, but at all times. A dealer must collect his bills or his business will be a failure, and he should not be afraid to push collections for fear of what his competitors will think. Some dealers imagine that if they go after their bills too hard others will think they are not very prosperous, and so they are likely to let them accumulate, with the result that a goodly number of people never get fully caught up in their payments. A competitor will have only respect for a man that shows a whole lot of energy in going after his bills and seeing that they are paid when they fall due.

In looking after collections in the summer months a dealer should be persistent and in a courteous way explain that he needs the money just as bad then, if not more so, than he would later on in the year. He can also point out how, if payments are not met when they fall due, it will be more difficult to pay up several payments when winter arrives. In explaining the matter bluffing or threatening should be avoided on the part of the dealer, as those tactics usually obtain nothing in the end.

At the present time there is more money in circulation than there has been for some little time past, and, since it is being spent, the electrical merchant might as well get his share as to have it go to some one else. When a payment comes due the dealer should be on hand to collect it. The person owing the bill probably owes other merchants in other lines of business, and so the electrical dealer should get around in good time, as first come is liable to fare better than those coming after.

"Going after collections personally is far better than going after them by letter," answered Mr. Edwards when asked what plan he considered best to hurry along summer collections. "If one tries to make collections by letter during the summer months he will find that he gets little or no results. People will receive their bill through the mail, look at it and throw it down some place where they will never see or think of it again. Of if they do think of it they will lay it away intending to pay it after vacation is over—provided they have any money left. They couldn't think of paying it now, for, as has been said before, they are finding many other places for their money in enjoying the pleasures that arrive with the summer months. They figure that there is plenty of time to pay the bill later and the electrical merchant can wait their pleasure in the matter. So I consider that the only way to get any satisfaction in collecting money at this time of year is go after it personally, and then you know right where you stand. A bill sent through the mail may have some advantages, and in some cases it may bring results, but I prefer the personal-visit method in making collections—I find it is much more apt to bring results.

"In summing up I would say that one of the chief problems confronting the electrical merchant during the summer months is the collection problem, and it should come in for a good deal of attention on his part. A mighty good motto for a dealer to bear in mind is: "Collect now." It would not do any harm for him to have this motto on a card and placed on his desk where it will be in plain view. It will be a reminder that he has collections to make and must work hard at it all during the summer and early fall. It means work, but if that part of the business is given the proper attention now it will save a good deal of trouble and work this winter."

Electrics in Dairy Service

The old adage "cleanliness is a virtue" certainly applies to the electric vehicle from which is eliminated the dirt and grime of oil and grease so much in evidence in other types of motor cars.

It is significant that eight dairy companies in London use electric vehicles for dairy work. They are an essential item in the "clean milk" campaign.

Besides being a splendid advertisement because of its dignified and neat appearance, the electric is superior to the horse in that it is capable of more speed, an important factor in this service, and at the same time holds its own against the horse as well as the gasoline truck because of its economy of operation, and the absence of disagreeable odors. In the dairy service which necessitates early deliveries and many stops within a short space of time, the electric is the chosen vehicle.

The Electric Vehicle Section of the National Electric Light Association has secured interesting information from many dairies in the United States which are operating electrics especially designed for this service, and all are more than satisfied with the efficiency and economy of the electric.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Does Force Act on Electric Currents or Conductors?

To the Editor:

An editorial in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 18, entitled "Deplorable Looseness of Speech," severely criticised the Bureau of Standards because of the title of one of its scientific papers. The paper in question was a mathematical one entitled "Calculation of the Maximum Force Between Two Coaxial Circular Currents," and the criticism was that the attraction was not between the electric currents, but between the conductors carrying electric currents. To speak of the force (of attraction or repulsion) between currents has been more or less common for more than half a century, and the meaning was conceded to be perfectly clear; but the editor thought it a loose and incorrect expression, apt to "lead one not already informed on this matter to entirely incorrect conclusions," and took the Bureau seriously to task for using it.

I think the expression is justified by two good reasons: first, because it is clear, concise and in common use; and, second, because *it is correct.*

The editor says that "Force exists between conductors which carry electrical currents, but not between the elements of current themselves. If the latter were the case, a continuous current would not be distributed uniformly over the cross-section of a conductor." We know that the force acting between two conductors ceases when the currents cease. Hence either the currents attract each other (dragging the conductors with them if they move) or else they change the nature of the conductors in some unknown manner so that when carrying currents the conductors attract each other. The former supposition certainly seems more reasonable, and in harmony with recent experimental and theoretical investigations. According to modern ideas, the electric current is due to a motion of the negative electrons in conductors, the strength of the current being proportional to the average number of the moving electrons per unit length of the conductor and the mean velocity of the electrons. A stream of cathode particles in a vacuum tube constitutes a current, which is deflected by the magnetic field of a permanent magnet (or of an electromagnet or a linear current) as a current in a wire would be; and also sets up a magnetic field which will act upon a magnet just as the current in a wire will do. This supports the notion that a conductor is not essential to the process.

Assuming, however, for the sake of the argument, that the force acting is directly between the conductors carrying current, and not between the currents, let the copper wire A which is attracting a second copper wire B be replaced by a vacuum tube (carrying a cathode current of the same strength), such as a Coolidge tube, which has as perfect a vacuum as possible. The magnetic field due to A which causes B to be attracted, remains unchanged, but the material conductor A is now replaced by a vacuum. If the force is considered as due to the conductor through which the current is flowing, we should have to say that a vacuum within the glass bulb A, through which an electric convection current was passing, was attracting the copper wire B; and since action and reaction are equal, the copper wire B was attracting the vacuum A. This is an impossible result, for a mechanical force cannot act on a vacuum. On the other hand, regarding the force as acting on the current, there is the mass and momentum of electrons for force to act upon, and the change in direction of motion of the electrons shows that it does so act. Indeed, it is by just such an experiment in which the force of a magnetic field on the electronic current causes the latter to be deflected, and even to flow in a complete circle, that the velocity of the electrons is measured.

It is sometimes asserted erroneously that a current cannot flow in a vacuum. In point of fact, the difficulty is not in getting electrons or ions to travel across a vacuum under a potential-gradient and so give a current. The real difficulty is in getting the ions into the vacuum sufficiently rapidly to create a considerable current, and at the same time to avoid the electrostatic effect if they are allowed to accumulate in the space. This is done in the Coolidge X-ray tube by heating the cathode to a high temperature, which expels the negative electrons rapidly, and then applying a steep potential-gradient which carries them rapidly across to the anode. In a partial vacuum, comparatively few electrons escaping will ionize the gas, each electron producing a great number of ions. The carriers being thus enormously multiplied, the current is greatly increased, and hence we say a partial vacuum is a much better conductor than a high vacuum. The vacuum of a Coolidge tube is extraordinarily high (0.00001 millimeter of mercury pressure); and as there is no ionized gas in the tube, the only carriers of current are the negative electrons driven out of the tungsten cathode because of its high temperature. If the potential difference between cathode and anode is only moderate, the ions move relatively slowly, and there is a great accumulation of negative electricity in the space, which lowers its potential near the cathode and tends to drive the electrons back to the cathode. By using a large potential difference the electrons are swept away as fast as they emerge, and a considerable current flows. As there is no resistance in the vacuum (that is, no energy is expended in overcoming the resistance of the vacuum) the work done on the electrons by the external battery or other source of energy is stored up in their increasing kinetic energy, and given up to the anode target when they impinge upon it. Thus a heavy tungsten plate is heated white hot, and a kilowatt or more of power is delivered by this vacuum current. The kenotron and pliotron are other instruments which utilize these electronic vacuum currents very successfully, the vacuum in some cases being as high as a millionth of a millimeter of mercury. So far as the magnetic effect of this electronic current in a vacuum or the effect upon it of an external magnet or a parallel current, it is similar to the case of a current in a wire, except that in the former case the force changes the momentum of the electrons and in the latter case the force exerted upon the current (i. e., moving electrons) is transmitted immediately to the wire, since, as will be shown below, the current cannot move without moving the wire.

Now consider two parallel metal wires. Their atoms are charged positively, and within and among the atoms are the negative electrons, equal in number to the number of unit positive charges. The free electrons drift through and between the positive atoms if a gradient of potential is established in the wire, but otherwise they move like the atoms of a gas in all directions. The distribution of electrons must be uniform if the positive atoms are uniformly distributed, for otherwise there would be accumulations of positive electricity at some

places and negative at others, and the electrostatic forces brought into action would immediately restore a uniform distribution. As the current is due to the movement of the electrons along the wire, we see that the current-density will be uniform if the electrons are uniformly distributed. This will be so if the positively charged atoms are uniformly distributed, which is the case if the conductor is homogeneous. The very slight attraction of the two currents does indeed tend to draw the electronic current in A toward B, and that in B toward A. But this force is so feeble compared with the enormous electrostatic forces which tend to maintain an equal distribution of the electronic current, that the resultant dissymmetry is inappreciable.

Taking the number of atoms in a gram of copper as 10^{22} and in a cubic centimeter of copper as 8.9×10^{22}, and the amount of positive electricity (two unit charges) of an atom of copper as 9.3×10^{-10} electrostatic units, the quantity of positive electricity per cubic centimeter of copper is 8×10^{13} electrostatic units approximately, and this is neutralized by the equal negative charges of the electrons. To displace a current uniformly distributed over the cross-section of a conductor one centimeter square, so that on one side the current would be one part in a million greater than on the other, it would require that there be more moving electrons on one side than on the other by one in a million of all. Assuming in order to be very conservative that the ratio of free to bound electrons is only one to a thousand, there would then be 1.8×10^{14} more electrons on one side than on the other. This would represent a charge of 80,000 electrostatic units, which would charge a condenser having plates of one square centimeter area and a half centimeter between, to a potential of 500,000 electrostatic units or 150,000,000 volts. This shows why the distribution of current over the cross-section of a homogeneous conductor is uniform and cannot be made appreciably non-uniform by the action of a magnetic field. It also shows that because the current-density is observed to be uniform, we should not conclude that there is no force acting between a current and a magnetic field.

It thus appears that the forces do act upon the electric currents whether they are electronic currents in a vacuum or electronic currents in material conductors. If the currents are flowing in a solid (such as a wire) or in a liquid (such as mercury) the conductor is dragged along with the currents, because the electronic currents are held in place by powerful electrostatic forces. In every case, therefore, it is *strictly true to say that the currents attract each other,* and it is only apparently true that the conductors *directly* attract each other. By this it should not be understood that the currents attract each other by anything like action at a distance of one on another. But the resultant magnetic field due to the two currents acts primarily upon the currents themselves, the effect upon the conductors being secondary.

This is, of course, directly contrary to Maxwell's explicit statement in one place that the only force which acts on currents is electromotive force, and that the mechanical forces act only between the conductors. But the development of the atomic theory of electricity, and the explanation of metallic conduction, together with the world of experimental evidence to prove the substantial truth of the modern theory, have appeared since Maxwell's time. Moreover, Maxwell was treating the subject mathematically, and was not in that place attempting to explain the mechanism by which the magnetic field was able to act on the conductor. In other places, however, Maxwell speaks of the "action of a finite current on the element of another" (515), "complete expression for the action between two finite currents" (520), "repulsion between the direct and the return current" (686), "attraction between two parallel circular currents" (699). The last is the same expression as used in the title of the Bureau paper in question. Many other instances of such expressions occur in Maxwell. J. J. Thomson usually speaks of the force between currents, but sometimes he says circuits instead of currents. Thus, "Mechanical force acting on an electric current placed in a magnetic field," "Force between two infinitely long straight parallel currents," "Force between two coaxial circular circuits." Silvanus P. Thompson, in speaking of Ampere's discovery of the attraction of one current by another current, says in a footnote (section 389 of his "Lessons in Electricity and Magnetism"): "It would be more correct to speak of the force as acting *on conductors carrying currents,* than as acting on the currents themselves." But this was written before the modern theory of electric currents was developed.

As an electric current is now regarded as made up of moving electrons, each possessing mass and obeying the laws of mechanics, it is easier now than in Maxwell's day to see that mechanical force can act between electric currents, as it does between two electric charges, *the conductor being moved because the electric current in the one case, the electric charge in the other, is bound to the matter and drags it along.*

It will not do to say that the current is a part of the conductor, because the electrons are within the conductor. The electrons are the electricity, and there are as many of them present when there is no current as when there is a current. The electrons in motion constitute the current, and the magnetic field caused by such current extends to the neighboring current and exerts force upon it, that is, upon the moving electrons. This force is independent of the nature of the conductor, provided it is nonmagnetic. The latter may be solid, liquid or gaseous, *or absent altogether.* To regard a conductor as the active agent, instead of the current within it, and the force as an action at a distance between two material bodies, is a crude and unphilosophical notion, unsupported by experimental evidence and out of harmony with modern ideas.

The Bureau of Standards means to be accurate in its scientific statements, and to follow good practice in notation and terminology, but it fully realizes that the editorial scrutiny of its publications, though painstaking and as thorough as possible under the circumstances, is not perfect.

Edward B. Rosa,
Chief Physicist, Bureau of Standards.

Washington, D. C.

Hydroelectric Development Begun in Western Vermont.

The Hortonia Power Company, Rutland, Vt., has begun work on an extensive hydroelectric development at Silver Lake, in Addison County, Vt. A power station 65 by 100 feet, constructed of steel and brick; a 300-foot concrete core dam; a 5-foot wood-stave penstock 2,800 feet long; and a surge tank 80 feet high and 16 feet in diameter, are features of the undertaking.

Three turbines, each of 3,200 horsepower rating, will be installed in the station, fed from 36-inch steel penstocks, which will lead down the mountain side 2,200 feet, with a fall of 670 feet.

Utility Companies Promote Flood-Lighting of Statue of Liberty.

As a means of creating interest in the fund that is being raised to illuminate the Statue of Liberty in the New York harbor, the Denver Gas & Electric Company has just finished arranging a window display featuring the Statue of Liberty. The display is very true to life, although on a small scale. At night the display is lighted, as nearly as possible, after the manner of the lighting of the real statue as it will appear when the lighting equipment is installed. The Danbury (Conn.) & Bethel Gas & Electric Light Company, operated by Henry L. Doherty & Company, announced that it would present to the factory or organization making the largest contribution to the fund for the illumination of the Statue of Liberty a six-foot miniature of the statue, the award having been made July 14.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Holophane Reflector-Refractor.

An objection has sometimes been urged against the use of open reflectors because with the very brilliant lamps now in common use considerable glare is noticed when looking directly at the filament which is exposed to view in the opening of the reflector. An ingenious way of overcoming this objection, and at the same time developing a semi-inclosing glass unit has been perfected in the new

Fig. 1.—New Holophone Unit.

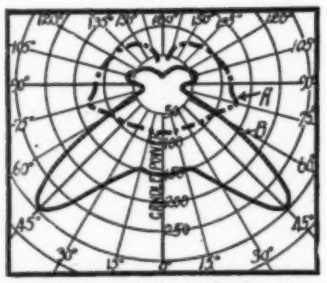


Fig. 2.—Photometric Curve.

reflector-refractor which is being marketed by the Holophane Glass Company, Incorporated, 340 Madison Avenue, New York City.

As shown in Fig. 1, this unit in its upper portion resembles the Holophane prismatic reflectors in common use, the prisms in this case being used principally for reflection. The lower portion of the unit, designated as the refractor skirt, is used both to refract the light into useful direction which has previously been reflected downward by the upper prisms, and also to screen the lower portion of the lamp. The character of the light distribution obtained is shown in Fig. 2, which indicates that very uniform illumination can be obtained over a zone having a diameter about twice the mounting height of the unit. About 54 per cent of the light from the lamp is directed into the space between the units and fully 65 per cent of it is directed below the ceiling, leaving enough illumination on the ceiling to remove the gloomy aspect commonly noticed in rooms using opaque reflectors. The reflector is given a velvet finish, which further softens the light without materially affecting the distribution. The hole in the bottom of the unit is large enough to permit inserting or removing lamps for cleaning or renewal; it also serves to prevent the accumulation of dirt and insects.

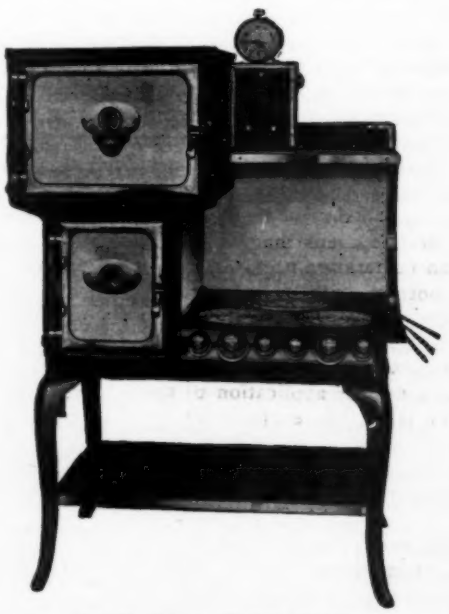
The unit is quite attractive and its new shape gives a pleasing variety to illuminating glassware. This unit is intended for interior lighting. These units are particularly suitable for use with type C Mazda (gas-filled tungsten) lamps. The one shown in Fig. 1 is designated as "2110 V.F." Its diameter is 7.5 inches and it is especially suited for use with the new 75-watt type C lamps, either clear or tip-frosted. It is also suited for use with 100-watt type C lamps. The unit designated as "2120" is especially adapted for 200-watt type C lamps. These units have been found very satisfactory for use in offices, stores, libraries, schools and public buildings. They give a very satisfactory light distribution, minimize the disadvantages of direct lighting and have free air circulation about the lamp so as to insure long life.

New Electric and Combination Gas and Electric Ranges.

Rapid advance in the manufacture of electric ranges is indicated in the new catalogue on this subject just issued by the Westinghouse Electric and Manufacturing Company, of East Pittsburgh, Pa. The features of automatic time switch to turn on the current and automatic thermostat to cut it off, which distinguish the Westinghouse ranges, continue with the further addition of three-heat control for each heater in the ovens as well as on the stove top. New ranges have been brought out, the most important of which are those furnished with gas-stove tops and electric ovens, this combination being particularly adapted to localities where the cost of energy is high, and, therefore, stove-top heating, which requires continuous application of heat, is rather expensive with electricity. The fireless-cooker principle used for the ovens in connection with the thermostat cutoff makes the ovens very economical to operate.

All parts of the range are of metal and, while they are so constructed that parts cannot work loose, every part is quickly accessible for thorough cleaning, and repairs can be made quickly. It is claimed that these are the only ranges approved by the National Board of Fire Underwriters.

Meals can be cooked automatically on these ranges; that is, the housewife can put the food in the oven at any time of the day and set the clock for automatic starting at the proper hour, at the same time setting the thermostat to cut off at the proper temperature. Baking, roasting and



Westinghouse Electric Range.

boiling can be done in this way. When the proper temperature is reached, which requires ten minutes to half an hour, depending on the temperature required, the current automatically cuts off and from then on cooking proceeds

as in a fireless cooker. The heavy heat insulation about the walls of the oven—two inches of rock wool—causes the ovens to retain their heat for hours. No attention is required until the hour arrives at which it was determined the meal should be ready. Breakfast can be prepared the night before with the assurance that it will be ready exactly on time.

Combination Gas and Electric Range.

Not only does this feature make the ranges particularly convenient for the user but makes an exceptionally desirable load for the central station, inasmuch as the peak of the range load comes an hour and a half to two hours before meal time.

Cooking processes that do not require much time and for which the food cannot be prepared in advance are performed on the stove top. For this purpose, the electric ranges have two 8-inch and one 10-inch radiant heaters, each with a special three-heat indicating control switch. In the combination gas and electric ranges, the stove top is provided with four gas burners, one of which is of extra large size with a small specially controlled simmering burner in the center. All the burners can be lighted instantly by means of an automatic gas lighter controlled by a valve at the front of the stove which normally burns a very small pilot flame.

It is claimed that better cooking results can be obtained in the electric ovens than in a gas range owing to the fact that two heaters are provided, one at the top and the other at the bottom, with baffle plates to provide a uniform distribution of heat. Pastry can be browned just as in any other kind of range. It is also claimed that food shrinks less in these electric ovens than in a gas oven, owing to the more flexible application of the heat and the fact that the oven is entirely enclosed except for a small ventilating pipe.

One feature of the Westinghouse electric ranges is the fact that they can be thoroughly scoured in every part. Everything, including the rack holders, can be removed from the ovens and the surface flushed with water without the slightest injury. There are no inaccessible places where dirt or grease can collect.

About 82 styles and combinations of ranges are manufactured in these general models, some of the styles being illustrated herewith. The load varies between 2,000 and 13,700 watts, depending on the size and style, and the load-factor is said to be less than 50 per cent.

As for operating expense, a large number of tests have demonstrated that the consumption of energy averages between 75 and 100 kilowatt-hours a month for the straight electric ranges and considerably less where gas is used for the stove top. In the combination ranges the fact that these ranges have gas stove tops, and in addition, that the ovens operate on the fireless-cooker principle makes them very economical to operate. The gas is used only for boiling and frying operations, and for baking or roasting only enough electricity need be used to heat the ovens and the food to the proper temperature to ensure self-cooking.

Bryant Exhibit at Contractors' Convention in New York.

Directly opposite the entrance, and one of the most conspicuous sights on entering the hall where the exhibition was held during the convention of the National Electrical Contractors' Association at the Hotel McAlpin, New York, N. Y., July 17 to 22, was a large red Bryant shield pointing the way to the entire northeast corner of the room, which was devoted to the exhibit of the Bryant Electric Company, of Bridgeport, Conn.

Here reigned supreme "Spartan," dressed in full regalia and serving as the animated trade mark of the line of standardized attachment plugs and receptacles which the Bryant company has brought forth. Nearly 400 combinations are possible with the Spartan plugs and receptacles already available and the line is, by the nature of things, continually increasing. Beside the animated "Spartan" was found one of the famous Bryant "pin-wheels," a disk upon the periphery of which were mounted various Spartan plugs and which were surrounded by a circumference of Spartan receptacles so that any plug may be brought opposite and in natural co-relation to any receptacle.

In addition to the Spartan line of plugs and receptacles the Bryant company exhibited also by "pin-wheels" the famous "New Wrinkle" line of shells and sockets and also a complete demonstrating outfit showing the operation of the Bryant hospital signalling system, designed for the regular 110-volt circuit.

Two cabinets of "Dead Front Panel" switches, one for surface work and the other for flush work, portrayed perfectly this interesting line of Bryant apparatus. Various other switch, socket and outlet specialties were portrayed by suitable demonstrating boards and appurtenances.

Spartan Exhibit of Bryant Electric Company at Contractors' Convention.

Far from the least interesting detail of the Bryant exhibit was the presentation to members of the Association of a heavily gold plated watch fob made from "pull" chain —the identical chain used for standard pull sockets, the Bead Chain Company of Bridgeport, Conn., having contributed the chain. "New-Wrinkle" cigars and "Wrinklet" cigarettes were enjoyed by smokers who visited the Bryant booth.

At the dinner on Friday night of convention week "Spartan" blow-outs were distributed at an opportune time —meeting with great favor by the diners. These devices normally coiled like a spring, expand with great rapidity when air is forced into them and at the same time emit a whistling sound which is appropriate to conditions prevailing at the average banquet.

The Bryant delegation included the following: F. V. Burton, Eastern sales manager; Robert Abbott, from the New York office; F. B. Chapman and F. B. Raves, eastern field representatives; and G. V. W. Ingham, W. A. Stacey and J. W Thomas, from the Chicago office.

Extensible Coupling for Mill Drives.

Any user of herringbone gears is familiar with the bad effect of end thrust or any constraint which does not leave the gears perfectly free to aline themselves. The resulting noise, vibration and wear is very objectionable, espcially in the case of rubber calender rolls where a very smooth action is desired. Many efforts have been made to remedy the trouble, which has always been an objection to the use of herringbone gears.

The use of any fixed end thrust causes too much constraint, and the lack of same allows any lateral motion due to the drift of the motor armature or any other external forces acting on the shaft to be transmitted directly to the pinion, with the disagreeable results before mentioned. Flexible couplings have been, and are being, widely used with the idea of relieving the gears from these end thrusts, but the existing types are designed primarily to take care of

Combination Magnetic Clutch and Extensible Coupling.

mis-alinement and possess sufficient axial friction at working loads to transmit end pressures of objectionable magnitude. They therefore do not afford a true solution of the problem. The problem was to design some form of connection between the motor and herringbone pinion which would (1) transmit the necessary power, (2) leave the pinion free to aline itself with the gear, and (3) leave the pinion unaffected by any end thrust caused by lateral motion of the shaft; in other words, what was wanted was a perfectly extensible coupling.

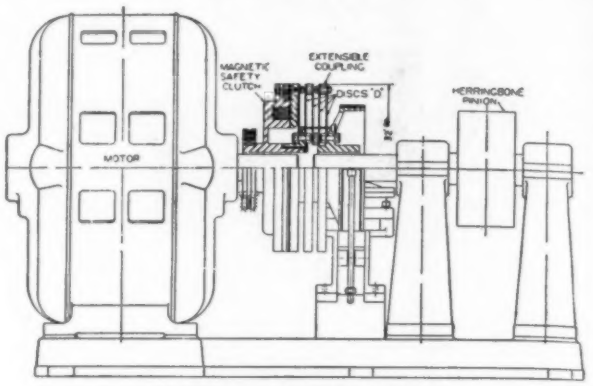


Diagram of Coupling Installed.

Such a coupling has been recently put on the market, and is shown herewith. It is shown in connection with the well-known magnetic safety clutch which has been in use on calender rolls for some years. The clutch and coupling together form an ideal drive for rubber rolls.

The mechanical construction of the coupling is very simple, as can be seen by the accompanying illustration. The only problem in the design was to make the disks D as strong as was necessary to transmit the torque, and at the same time secure the utmost flexibility independent of the amount of torque transmitted. It may easily be seen that the amount of torque transmitted is only dependent on the thickness of the disks, and the size of the bolts. The extensibility is only dependent on the flexibility of the disks, and is absolutely independent of the amount of torque transmitted, in that it is the same when no load is being transmitted as when the load is maximum.

In order to secure the utmost extensibility the disks are laminated, i. e., each disk consists of several thin disks bolted together. The deflection of a thin circular plate under a given load varies inversely as the cube of the thickness. Three one-eighth-inch disks will transmit the same torque as one three-eighth-inch disk, but the three thin disks will deflect nine times as easily as the one thick disk. Practice has demonstrated the correctness of this theory, and in the case of a 32-inch coupling recently built the force necessary to cause a deflection of a large part of an inch, was much less than the end sliding friction in the bearings.

In aiming to secure extensibility, flexibility has also been secured to a much greater extent than in any of the usual flexible couplings. The flexibility, like the extensibility, also is unaffected by the amount of torque transmitted.

While so far this coupling has been applied only to rubber-calender work, where it has met instant approval, it is not limited to this field, and may be applied in any case where a truly extensible coupling is desired. It is manufactured by the Cutler-Hammer Clutch Company, Milwaukee, Wis.

New Features of Royal Washer.

The accompanying illustration shows an improved type of the Royal electric washing machine which is being placed on the market by Haag Brothers Company, of Peoria, Ill. It will be noted from the illustration that there are two dollies on a flat disk and the other the usual peg type, either of which can be supplied. One of the features of the new washer is the revolving wringer with reversible drainboard, which permits wringing into and out of from

two to four tubs. The wringer has no set stopping place, but is equipped with a patented locking device which holds it firmly at any desired position. Another feature of the

New Haag Washer.

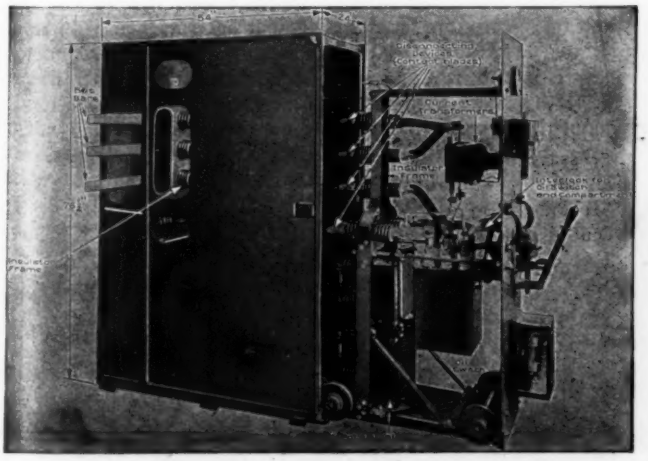
Royal washer is the extension casting on the legs, enabling the operator to quickly and easily adjust the height of the machine to correspond with the wash bench or stationary tub so that the wringer can always be brought close to the tub, doing away with all splashing when wringing.

Another feature of this machine is the heavy tub made of 1.25-inch white cedar with unusual deep corrugations which act as a very efficient washboard. The tub is equipped with a screw drain pipe arranged for attaching a hose.

The Haag Royal electric washer is an inverted drive machine with all mechanism under the tub, the dolly post coming up through the bottom of the tub. There are no gears on the lid or sides and the machine is pronounced absolutely safe in every respect.

Safety-First Truck-Type Switchboards.

In every switchboard installation, protection against accidents should receive careful consideration. This applies particularly to the industrial plant, and doubly so if the panels are mounted in such location that access to them can be had by employees comparatively unfamiliar with electrical devices. In the latter case the safety-first truck-type switchboard units here shown are eminently fitted.



Removable-Truck Switchboard Unit.

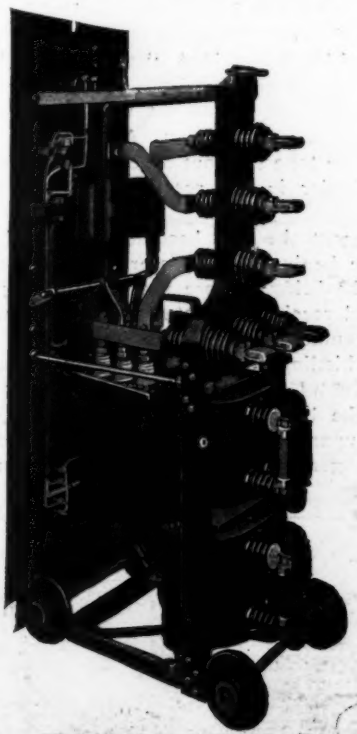
All live parts are inclosed, and danger of coming in contact with live circuits is practically eliminated. Oil switches, busses and other live parts are in compartments. This tends to reduce fire hazards and to limit disturbances to a single point. Extensions can be readily made or the units moved to other locations if desired.

Another marked advantage of this type of construction is the ease of inspection or replacement. The switchboard panel is mounted on a carriage which can be readily removed from and replaced in a stationary structure, but only when the oil switch is open. With the oil switch closed it is impossible to remove or insert the truck because of an interlock between the operating toggle of the oil switch and the stationary unit. In plants where feeders are standardized, spare panel trucks will permit systematic inspection of equipment with the least possible interruption.

The stationary member of the switchboard carries current and potential busses and disconnecting switch studs. Barriers between the current bus studs prevent accidental contact by any one who enters the compartment. The rear ends of the current disconnecting switch studs run to busses and incoming or outgoing leads; the potential bus wires to small contact studs near the top of the compartment. The side walls have hand holes, so that the bus bars and bus wires can be continued from unit to unit. These openings when not required can be closed by removable covers. Access to the rear of a compartment can be had by means of a two-section sheet-steel door.

The removable truck is mounted on wheels, and when withdrawn the equipment is dead and accessible from all sides. The fore part of the truck carries a sheet-steel panel on which is mounted the instruments, meters, oil switches and other appliances as shown. The current transformers are mounted on steel brackets on the back of the instrument panel. The rear of the truck carries the movable parts of the disconnecting switches, the potential transformers and small wire accessories. To center the truck and to assist in placing it in or removing it from a compartment, rails are provided for the wheels to run on.

The field of application of standard size units is limited to 7,500 volts and 2,000 amperes at 60 cycles, and 3,000 amperes at 25 cycles, on the main bus. Special units can be obtained for use up to 15,000 volts and 300 amperes. The current capacity of the removable element is limited to 500 amperes at 2,300 volts and above, and 800 amperes up to 600 volts. The units illustrated are made by the General Electric Company, Schenectady, N. Y.



Removable-Truck Element.

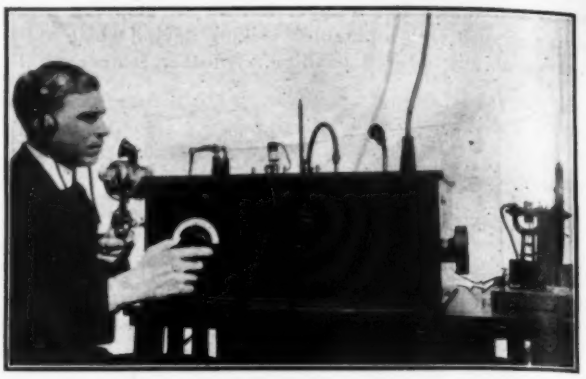
A WIRELESS FOG SIGNAL FOR MARINE USE.

By Albert Marple.

The latest and an extremely important invention to make its appearance in the wireless field is the wireless fog signal device just announced by Earl C. Hanson, of Los Angles, Cal. Mr. Hanson is now 22 years of age and many years ago saw that something should be devised which would absolutely make it possible for officers upon ocean liners and other ships to travel in safety during storms and dense fogs. The fog horns and the searchlight methods of the present time are not efficient and to their unreliability are due only too often many fatal accidents. When but a lad of twelve years, Hanson realized that wireless was the only thing that would make ocean travel, so far as collisions and running into rocks is concerned, absolutely safe. He then started to "find a way out" and, although it has taken him a long time, he has now found that way.

This new type of fog signal consists of two principal parts—a wireless telephone and a rotary contact breaker, both of which have been invented by Mr. Hanson. In operation this signal is not complicated. From the storage battery or other form of power plant the electrical energy passes to and through the rotary contact breaker, which is propelled by a motor, continuing then to the wireless telephone. After leaving the telephone it passes through a heavy cable and on to the aerial. By using the rotary contact breaker, instead of the transmitters, the device sends out electrical waves which may be regulated from a low buzzing sound to a high-pitched whistle. These are instantly caught by the receiving station, equipped with a gaseous amplifier, on the approaching boat the moment that vessel comes within the radius of the sending apparatus. As each boat is equipped with one of these combined sending and receiving stations, the moment the ships come within a specified distance of each other the officers on each are aware of the proximity of the other. The instruments may be so set that their radius is 100 yards or a mile, or even farther. As the boats continue to draw nearer, the tone sent out by each instrument registers louder and louder in the receiving of the opposing device.

At the moment the ship becomes enveloped in a dense fog or at the beginning of a storm, the officer takes his place upon the bridge before the wireless fog signal, adjusts the head receiver and starts the motor with propels the rotary contact breaker. So long as he detects no buzzing or whistling sound in the receivers that are upon his ears he knows that there is no danger from collision. But should the buzzing tone be heard the officer is put immediately upon the alert. These fog stations may be located at danger points along the shore, upon piers, etc.,



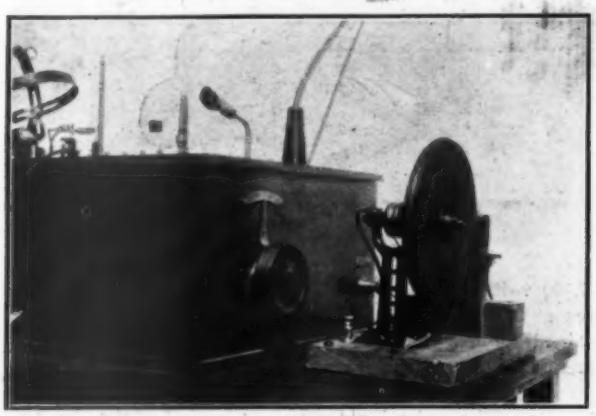
Inventor Operating Signal.

and being so situated would make it possible for officers of ships to avoid accidents which would otherwise occur.

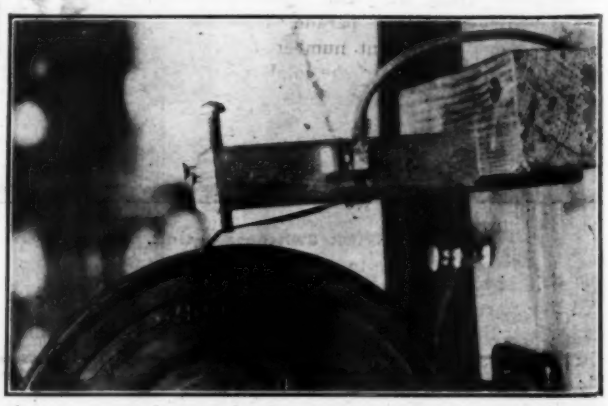
This fog-signal system would be especially valuable to vessels entering or leaving a harbor during a storm, at night, or during a heavy fog. The instruments at the danger points upon the shores or at the ends of the breakwaters, could, by a simple turning of a button at the side of the telephone, have their range fixed so that they reached out simply to the outer edges of the main channel. The apparatus on the incoming and outgoing boats would catch no sound from these devices on shore so long as the boats carrying them remained in the channel, but the moment the vessels left the channel on either side the instruments upon them would catch the warning from the wireless devices at the danger points. Different tones and dashes inform the officer upon the boats from which directions the warning waves are coming.

Another point about this apparatus, which makes it all the more remarkable, is that it may be used as a sea telephone as well as a fog signal. By simply turning a button or throwing a small lever, the officer upon the bridge may, just as soon as he catches the tone of another instrument, convert his instrument into a wireless telephone and may immediately begin a conversation with the captain of the approaching or passing ship. In fair weather this instrument may be used as a telephone between ships.

Possibly the most striking point about this system is that its waves are immune against interference with apparatus in existing stations. This would be a valuable feature in the event of war, or in fact at any other time, for if the boats of a nation were equipped with this low-frequency system, the officers on those boats could converse together without any danger of their messages, or even the fact that a wireless conversation was in progress, being detected.



Rotary Contact Breaker of Signal.



Showing Metal Plugs on Contact Breaker.

INDUSTRY ACTIVITIES

The Joseph Phillips Company, 2114 East Second Street, Cleveland, O., manufacturer of "Philectric" flashlights, flashlight batteries, lamps and accessories, has recently issued a new catalog and price list of its products.

The Emerson Electric Manufacturing Company, St. Louis, Mo., is having plans drawn for a seven-story building to be erected in Washington Avenue, between Twentieth and Twenty-first Streets and adjoining its present factory buildings. The cost of the new building is placed at $300,000.

Pyrene Manufacturing Company, New York, N. Y., has announced the appointment of T. F. Flanagan as general sales and advertising manager. Mr. Flanagan formerly was assistant to C. Louis Allen, who held this position until a few months ago, when he was elected president of the company.

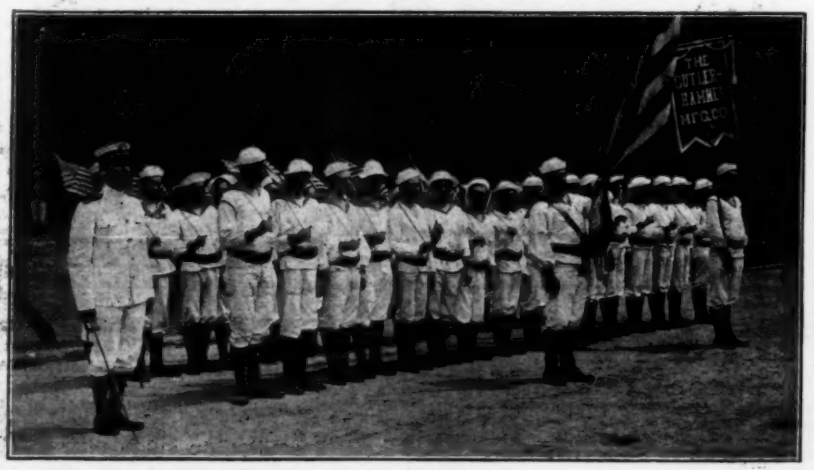
The National Conduit & Cable Company, 41 Park Row, New York City, in its last issue of "Copper Gossip," states that the present situation in the copper market is a waiting one, with new developments likely at any time, and the outlook excellent for a heavy consumption of copper during the balance of the year.

The Sun-Ray Manufacturing Company, Oshkosh, Wis., has issued a catalog sheet on the "Sun-Ray" electric heating pad. This pad is equipped with three-heat switch, the heating element being formed by spiraling the resistance wires on a cord and covering with asbestos tubing. This results in a flexible element of more than ordinary strength.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued Bulletin No. 1087A, on polyphase induction motors; Bulletin No. 1525A, on type AA-7a compressors for air-brake equipment; Bulletin No. 1530A, on type AC-3 air compressors for air brakes, both stationary and portable equipments, and Bulletin No. 1536, on stationary and portable air-compressor equipments for industrial purposes.

Holophane Glass Company, Incorporated, 340 Madison Avenue, New York City, has issued a folder for the trade on its new "2110" reflector-refractor unit. This unit has been designed to give a maximum illuminating efficiency with the 75 and 100-watt type C Mazda lamps, and is especially suitable for use in schools, offices, stores, libraries and public buildings. The folder is arranged to carry the imprint of dealers in the new unit.

Over 1,300 Cutler-Hammer Employees in Milwaukee Preparedness Parade.—The spirit of the Cutler-Hammer Manufacturing Company's organization was much in evidence July 15 when Milwaukee's preparedness parade was held. Over 30,000 people marched in the parade, and the Cutler-Hammer contingent numbered about 1,300, a good percentage of the total of 1,600 employees of the company. President F. R. Bacon, Treasurer F. L. Pierce and General Manager A. W. Berresford marched with the rest of the C.-H. workers and held their places in line even when a rainstorm drove many to cover. The division was headed by a special band, which was followed by a company dressed as marines. These were followed by other employees carrying flags and red, white and blue parasols, and all wearing colored paper hats. The parade was very successful and Cutler-Hammer representation elicited much favorable comment.



Cutler-Hammer Marines Who Marched in the Milwaukee Preparedness Parade.

Electrical Engineers Equipment Company, 711 Meridian Street, Chicago, Ill., has issued Bulletin No. 105, on cast copper fittings. Illustrations, dimensions and list prices are given for cable fittings and "shrink fit" copper-tubing fittings of standard sizes. A number of valuable tables are included in the bulletin.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Leaflet No. 3554-A, entitled "The Economy Produced by Using Reversing Planer Motors on Machines Having Reciprocating Motion," illustrations and a summary of machine-tool operating expense being given. The company has also issued Leaflet No. 3881, on trolley-line material, clinch ears, trolley splicers, frogs and suspensions.

Edison Storage Battery Company, Orange, N. J., has issued an interesting booklet on the use of storage batteries in railroad service. It is entitled "Train Lighting Batteries, Edison," and illustrations showing the batteries in actual service, as well as the construction of the individual cell, are given. The text is especially comprehensive and valuable to any railroad man having to do with storage batteries, embracing a description of the manufacture of the cells, their characteristics, battery troubles and their elimination, and giving special attention to the chemical changes involved on charge and discharge.

Test Runs for Electrics Made in Kansas City.—The electric vehicle trade, particularly of passenger cars, received marked stimulation recently through a demonstration of the suburban travel possibilities by Albert T. Clark, manager of the Kansas City branch of the Anderson Electric Car Company. Mr. Clark announced a run each day of the week to some town 25 to 40 miles from Kansas City. Passengers were taken on each trip, one car going each of five days, and two cars on one day. The round-trip distances were 53, 65, 67, 64 and 78 miles, and all were made on one charge except the last, to Excelsior Springs, when a boost of an hour was given the cars at the Springs. The rapid improvement of roads in the Kansas City district, particularly in Clay County, promise a radical increase in motor travel, more than 90 per cent of which, Mr. Clark showed, is within the compass of electric vehicles on one charge. Five Detroit electrics were sold during the week of the demonstration.

"Do it Electrically"
AMERICA'S ELECTRICAL WEEK DECEMBER 2 TO 9 1916
DO IT ELECTRICALLY
AMERICA'S ELECTRICAL WEEK DECEMBER 2-9-1916
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"DO IT ELECTRICALLY"
AMERICA'S ELECTRICAL WEEK
AMERICA'S ELECTRICAL WEEK DECEMBER 2 TO 9, 1916
"DO IT ELECTRICALLY"
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DO IT ELECTRICALLY
AMERICA'S ELECTRICAL WEEK
America's Electrical Week
"Do it Electrically"
DO IT ELECTRICALLY
AMERICA'S ELECTRICAL WEEK DECEMBER 2 TO 9 1916

Posters Submitted for America's Electrical Week.

As a feature of the celebration of America's Electrical Week, which is to be held December 2 to 9, the Society for Electrical Development decided to hold a poster contest in order to secure a suitable design to be used in the campaign. As a result of this contest over 800 designs have been submitted and the judges are now engaged in selecting the design which will be awarded the first prize of $1,000. The prize-winning poster will be the official emblem of the Week. In every case contestants were instructed that the idea of the contest was to obtain a design embodying the thought of electric service. Nine of the posters are reproduced herewith.

PERSONAL AND BIOGRAPHICAL

MR. P. W. DEPP, of Barren County, Ky., has been appointed superintendent of the power plant in the capitol building at Frankfort, Ky. He will assume his new duties on September 1.

MR. J. B. LONG, of the illuminating engineering department of the Commonwealth Edison Company, Chicago, Ill., has been appointed new-business manager of the Central Power Company, Grand Island, Neb.

MISS HELEN NORRIS, librarian for the Commonwealth Edison Company, Chicago, Ill., has been the guest of MISS O. A. BURSIEL, secretary of the New England Section, N. E. L. A., at Boston. During her stay, visits were made to the Boston Edison Company's welfare and service buildings, the House of Edison Light at Arlington, and other places of interest.

MR. GUY V. CARPENTER, for the past nine years managing partner of G. E. Bennett & Company, dealers in electrical material and specialties, Mutual Life Building, Buffalo, N. Y., will hereafter conduct this business under his own name. He will continue to act as selling agent throughout New York state, outside of New York City, for the Enameled Metals Company, the Steel City Electric Company and the Fairmount Electric & Manufacturing Company.

MR. ALEXANDER McKINLOCK, son of MR. GEORGE A. McKINLOCK, president of the Central Electric Company, of Chicago, Ill., is patriotically undergoing the training at the United States military camp at Plattsburg, N. Y. The athletic work which won him high honors on the Harvard football team made possible the successful accomplishment of camp duties much more easily and promptly than is usual with beginners in that severe military training camp.

MR. CHARLES PASCOE, former metallurgist for the Canadian Steel Foundries, Ltd., and recently connected with the Thos. Davidson Manufacturing Company, Ltd., of Montreal, as consulting metallurgist, has joined the Snyder Electric Furnace Company, of Chicago, Ill., as metallurgist in that company's electric furnace research plant at Clearing, Ill. MR. DOUGLAS WALKER, former salesman for the Snyder Electric Furnace Company, and in charge of the Chicago district, has been appointed sales manager.

MR. SOLOMON LEWENBERG, a Boston lawyer and a native of that city, was appointed recently as a member of the Massachusetts Gas and Electric Light Commission by Governor McCall, and succeeds JUDGE THOMAS P. RILEY. Mr. Lewenberg was born in 1876, was educated in the Bigelow Grammar School, the English High School and Boston University. He is a thirty-second degree Mason, a member of the Grand Tribunal, Knights of Pythias, and of the Boston City Club. Mr. Lewenberg's home is in the Dorchester district of Boston.

MR. JOSEPH BRADLEY MURRAY, who was recently made assistant general manager of the Edison Electric Illuminating Company of Brooklyn, is a young man who is generally recognized as one of the future factors of the industry. He was born in Albany, N. Y., March 19, 1888, the son of Mr. and Mrs. Thomas E. Murray. His early education was obtained in the parochial schools of Albany and in 1910 he was graduated from Sheffield Scientific School at Yale. While attending Yale his summers were spent working for the New York Edison Company, of which his father is vice-president, and it was thus he gained his first experience and ground work in the electric-lighting business, by actual contact with the public. Upon his graduation from Yale he entered

J. B. Murray.

the testing department of the New York Edison Company and a year later associated himself with the New York Electrical Testing Laboratories. Four years ago he became affiliated with the Edison Electric Illuminating Company of Brooklyn. His connection with the industry covers a period of more than ten years, including the summers while he was a student at Yale. His rapid rise has been due to studious application and conscientious effort backed by a mind naturally adapted to the grasping and solving of central-station problems. Mr. Murray recently married Miss Teresa Farrell, daughter of James A. Farrell, president of the United States Steel Corporation. He is a member of the National Electric Light Association, the Jovian Order, the American Society of Electrical Engineers, Illuminating Engineering Society, Yale Club of New York and the Brooklyn and Crescent Athletic Clubs of Brooklyn.

MR. B. W. LATHROP, Camden, N. J., has been elected president of the Hackettstown (N. J.) Electric Light Company. MR. CHARLES DeF. BESORE, Philadelphia, Pa., has been elected vice-president and secretary.

MR. CHARLES M. CALDWELL, who was city electrician of Kansas City, Mo., about ten years ago, has been appointed to the same position again, and succeeds MR. M. E. BATES, resigned.

MR. JOHN I. MANGE has been elected vice-president of the J. G. White Management Corporation, New York, N. Y. Mr. Mange has been associated with that concern since 1912, at which time he was elected vice-president of the Associated Gas & Electric Company, a holding company of electric and gas properties in New York, Kentucky, Ohio and Tennessee, managed by The J. G. White Management Corporation. Mr. Mange was born in Pembroke, Me., in 1876. He attended the public schools in Pembroke and in Kingston, Mass., and graduated in 1899 from Tufts College. He has been connected at various times with the following companies: Charleston Consolidated Railway, Gas & Electric Company, Charleston, S. C., as chief electrician; General Electric Company, Schenectady, N. Y., in the switchboard department; Lachine Rapids Hydraulic & Land Company, Montreal, Can., as electrical engineer; Oneonta, Cooperstown & Richfield Springs Railway Company, Hartwick, N. Y., as electrical engineer and superintendent; Plattsburgh Light, Heat & Power Company, Plattsburgh, N. Y., as secretary and superintendent, and the Watertown Light, Heat & Power Company, Watertown, N. Y., as general manager.

OBITUARY.

MR. W. C. TEWKSBURY, a prominent electrical contractor of Milford, Mass., died July 29. He had been in business about 25 years and was well known among the contractors of Massachusetts. He was a member of both the national and the state contractors' organizations.

THE REVEREND SAMUEL PRICE, father of Charles W. Price, editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, died at Wellington, Kans., on Sunday morning, July 30, in his ninetieth year. The Rev. Mr. Price was for 34 years a resident of Wellington, was widely known as a Methodist minister, and well loved and highly respected in the community for his splendid example of life and unfailing gentleness and kindly interest in his fellow men. Mr. Price was born in Belmont County, O., January 26, 1827. The family originally came from Wales; Major-General Sterling Price, of the Confederate Army, was his cousin. The Rev. Mr. Price served in the Union Army as colonel of an Ohio regiment. He also was for several years editor of the Barnesville (O.) *Enterprise*. He was the father of ten children, seven of them surviving his death. These are Mrs. Alice F. Chastain, Iola, Kans.; Mrs. J. J. Hoge, Wellington; Mrs. F. G. Franklin, Albany, Ore.; Charles W. Price, New York, N. Y.; Bertha C. Price, Maude A. Price and Fletcher Price, Wellington.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

WHITEFIELD, N. H.—Important changes and improvements have been made in the plant and service of the Bethlehem Electric Light Company under the direction of Eugene Carpenter, Newton, Mass. New generators have been installed and the plant otherwise brought up to efficient working conditions.

HOLYOKE, MASS.—Six bids for a new coal conveyor for the municipal electric-light station were opened August 1. They ranged from $3,652 to $7,819, and many were of so complicated a nature that the awarding of the contract was deferred until the bids have been given closer study.

HUBBARDSTON, MASS.—The Council has granted the petition of the Gardner Electric Light Company to extend its transmission lines to this city.

LEOMINSTER, MASS.—The contract with the Connecticut River Transmission Company for the lighting of streets and public buildings of this city expires in December. Some agitation has been made for the municipal acquisition of an auxiliary plant, formerly operated for local supply, but now owned and held in reserve by the Connecticut company. The mayor, however, opposes the idea of the city undertaking a lighting business.

NORTON, MASS.—The Norton Power & Electric Company has been authorized to issue 80 shares of new stock, 68 shares to purchase property held by a trustee in bankruptcy valued at $6,933 and formerly operated by the Norton Electric Light & Power Company and 12 shares to pay for line extensions which will at once be undertaken. The stock is to be issued at $100 per share.

PLYMOUTH, MASS. — The Plymouth Cordage Company is about to install a central power generating plant for all its mills here. At present each mill has its own power station, steam being used in two mills and gas engines in the other. A 2,000-kilowatt and a 500-kilowatt steam turbine will be installed to supply energy for motors to be installed throughout the mills.

WORCESTER, MASS. — The Massachusetts Gas and Electric Light Commission has approved the issue, by the Worcester Electric Light Company, of 2,000 shares of new capital stock, par value $100, at $200 per share, the proceeds of 1,350 shares to be used to cancel notes outstanding May 31 last, incurred for additions to plants since October, 1914, and amounting to $270,000; and the proceeds of 650 shares to pay for machinery and street lighting equipment, including 150 luminous arcs bought since May. The total cost of the new work will be over $250,000.

BRISTOL, CONN.—The Bristol & Plainville Tramway Company, operated by Charles H. Tenney & Company, Boston, Mass., and supplying electricity locally for light and power, announces a reduction in rates, the second since the Tenney Company acquired control. The new rates are 12 cents for the first 200 kilowatt hours, 10 cents for the next 200 and 8 cents for all over 400. This represents about 8 per cent saving over former rates.

BINGHAMTON, N. Y.—Further details regarding the Binghamton Light, Heat & Power Company's new plant now in course of construction near Johnson City, have been announced. It will have an initial capacity of 7,500 horsepower with provision for a much greater capacity to be installed as future requirements demand. It is expected that this energy will be needed to take care of the community's demands, in addition to the capacity of the present plant, by the time the new plant is ready for operation on January 1, 1917. The building will be 60 by 200 feet, of brick and steel. The brick stack will be 200 feet high, with a diameter of 12 feet at the top. The boilers, turbines, generators and other parts of the eulpment were ordered several months ago.

WATERTOWN, N. Y.—A contract for the new power plant of the New York Air Brake Company at the east plant has been awarded to the Guarantee Construction Company, of New York City. Plans and specifications are being prepared by the Green Engineering Company, of Springfield, Mass. About 2,000 horsepower will be developed at the new plant.

NEW BRUNSWICK, N. J.—The Board of City Commissioners is considering the installation of a municipal electric plant, in connection with negotiations with the Public Service Electric Company for the installation of an underground system in the business section.

TRENTON, N. J.—The Board of Commissioners will build a new electrical building for municipal service.

HARRISBURG, PA.—The following affiliated electric companies have been granted charters to install and operate electric light and power systems in their respective localities: Cleveland Township Electric Company, Franklin Township Electric Company, Newberry Township Electric Company, and Rush Township Electric Company. H. F. Baker, Germantown, is treasurer.

HARRISBURG, PA.—Charters have been issued for four electric companies, three to operate in Adams County and one in Bucks. The Adams County companies were incorporated by Wendell W. Faunce, J. Edwin Weissenflub, and Fred B. Atherton, of Scranton, and the Bucks County company by J. C. Murtagh, West Chester; C. R. Maguire, Wayne, and Herman H. Wilson, Camden, N. J. The charters issued include Gettysburg Electric Company, to operate in Gettysburg and Strahan Township; Union Township Light, Heat and Power Company, Union Township, and Mt. Pleasant Light and Power Company, Mt. Pleasant Township, Adams County; capital $5,000 each. Warrington Township Electric Company, to operate in Warrington Township, Bucks County; capital $5,000.

NEW BRIGHTON, PA.—The Beaver Valley Traction Company is planning to construct two substations.

PHILADELPHIA, PA.—The Pennsylvania Railroad Company will build a new power house at its Reed Street freight yards.

SOMERSET, PA.—Lewis C. Lambert is at the head of a project to build a large hydroelectric power plant on Stonycreek River, near Mostoller.

WARREN, PA.—The Pine Grove Electric Light & Power Company has been incorporated with a capital of $5,000 by S. Q. Smith, of Warren, and others.

WILKINSBURG, PA. — State charters have been issued to the Westmoreland Electric Corporation, to operate in Greensburg; the Manor Electric Corporation, to operate in Manor, and the Woodlawn Light & Power Corporation, to operate in Woodlawn, the officers to be in Pittsburg. The capital of each of the companies is $5,000 and the incorporators are R. M. Evans, J. W. Miller and E. S. Hayward, of Wilkinsburg.

BLUEFIELD, W. VA.—The Appalachian Power Company contemplates placing an order this fall for one 500-kilowatt motor-generator set.

MARTINSBURG, W. VA.—The Potomac Light & Power Company will be organized to succeed the Martinsburg Power Company, the holdings of which were recently sold at a receiver's sale. Plans of the new company provide for expending $100,000 for improvements to the hydroelectric plant.

GEORGETOWN, DEL.—The Town Council has closed a five-year contract with the Eastern Shore Gas & Electric Lighting Company for lighting the streets of this city. According to the contract there will be 60 lamps installed. During the past month construction work has been progressing on a transmission line from Laurel, where the company's main plant is located, to this city. It is understood that the local plant, which has been supplying energy to this city and to Milton, will either be dismantled or used as a substation.

RALEIGH, N. C.—Deeds from various parties to the Carolina Power & Light Company aggregating 452 acres along the Swift Island section on the Yadkin River have been placed on record, and a number of options on other adjoining tracts have been given. This covers one of the best water power sites on the Yadkin River below the Narrows, and it is reported that this company will put on a force of hands within the next few weeks to commence preliminary work towards the development of another great power plant, at a cost of several millions of dollars. This plant will be about eight miles below Badin where the large aluminum plant is being built by the Aluminum Company of America. There is thought to be another big deal now under consideration for the Gun-Smith Shoals section about half way between Badin and Swift Island, but nothing is known as to the parties interested.

DAYTONA BEACH, FLA.—The City Council has been petitioned to establish or purchase an electric light and power plant.

JACKSONVILLE, FLA.—The Jacksonville Traction Company is considering the extension of its Ostrich Farm car line two and one-half miles at a cost of about $40,000. Hardy Croom is manager.

WEST PALM BEACH, FLA.—The Ariston Ice & Electric Company is increasing the capacity of its electric-lighting plant. A 375-kilowatt generator will be added. C. H. Ellis is manager.

WINTER HAVEN, FLA.—The Lakeland, Bartow & Winter Haven Interurban Railway Company has been chartered with a capital of $750,000. The company proposes to build about 25 miles of electric railway. J. L. Wilson, Altoona, Pa., is president.

NORTH CENTRAL STATES.

GENEVA, O.—At a special meeting of the Council an ordinance was passed authorizing the advertisement for bids for the lighting contract which will be renewed by the village on November 19, 1916. The contract will be for a period of ten years and will provide for furnishing electrical energy for the new lighting system.

PERRYSVILLE, O. — The Board of Trustees received bids this week for the reconstruction of the local electric-lighting system.

CROWN POINT, IND.—The Indiana Public Service Commission has received a petition from the Calumet Electric Company, which operates in Lake, Porter and Laporte Counties in Indiana and in Cook County, Illinois, asking for approval of a bond issue of $75,000 for betterments and extensions of the company's lines. The principal use of the proceeds would be to build a high-tension transmission line from its main trunk in East Gary through the territory near Hobart to Crown Point at a cost of approximately $55,000.

SEYMOUR, IND.—The Indiana Public Service Commission has denied the Crothersville Water & Light Company the right to operate an electric-lighting plant in Crothersville. Frank Brady, of that city, recently obtained a franchise from the city which the commission has approved.

CHICAGO, ILL. — The Commonwealth Edison Company has made plans for the installation of a 4,000-kilowatt rotary converter in its Franklin Street substation.

SANDWICH, ILL.—Bonds have been voted for the establishment of an electric-lighting plant.

STERLING, ILL.—The Illinois Northern Utilities Company, the Freeport Railway & Light Company, and the Tri-County Light Company have been consolidated and will be operated under one head. The new plan will eventually result in the erection of a large steam power house in Dixon or Sterling. E. D. Alexander is the general superintendent.

BAY CITY, MICH.—About $2,000 will be borrowed from the city sinking fund for

the purpose of assisting the electric light department in building a white way.

SAND LAKE, MICH.—Work has been started on a new electric-lighting system for this city. Energy will be supplied by the Universal Power Company, of Howard City.

JANESVILLE, WIS.—Work is being rushed by the Janesville Electric Company on the new concrete dam which is being constructed at the Indian Ford plant. Plans are being made for improvements at the upper dam in this city. New gates will be installed.

PALMYRA, WIS.—The voters of this city have approved a proposition to grant a franchise to the Milwaukee Gas & Electric Company to establish a lighting plant in this city.

WAUPACA, WIS.—It is reported that the holdings of the Waupaca Electric Light & Railway Company will be sold to a party of capitalists. E. A. Aspennes, of Montevideo, Minn., is interested in the negotiations and probably will assume the general managership if the deal is made.

WEST MILWAUKEE, WIS.—A contract for street lighting has been made with the Milwaukee Electric Railway & Light Company. The contract provides for a modern system to be installed during the next few months.

DETROIT, MINN.—The City Council has appointed a committee for the purpose of considering the sale of the local electric-lighting plant to the Otter Tail Power Company, of Fergus Falls. The company has made an offer of $20,000 for the plant, and proposes to furnish electrical energy for three cents per kilowatt-hour.

EMMONS, MINN.—A municipal electric-lighting plant will be installed here. E. D. Jackson, Capital Bank Building, consulting engineer, is preparing plans.

ERSKINE, MINN.—At an election held recently bonds in the sum of $5,000 were voted for the erection of a municipal electric-lighting plant.

MIDDLE RIVER, MINN.—Peterson & Loveid have been granted a franchise for the installation of an electric-lighting plant here.

WATSON, MINN.—A contract will be made with the Minnesota Valley Power Company, of Montevido, to furnish light and power for this village.

KINGSLEY, IOWA.—A franchise has been granted to the Iowa Light, Heat & Power Company to install and operate an electric-lighting system here.

MANCHESTER, IOWA.—The Hoag mill and water power plant has been sold to the Iowa Electric Company, which will combine it with the local steam plant recently acquired. The company is planning extensive improvements in the distribution system here.

PANORA, IOWA.—The Iowa Light & Power Company, of Cedar Rapids, has made a proposition to the Council for the purchase of the municipal electric-lighting plant. If the proposition is accepted a high-tension line will be erected from Perry to Panora via the towns of Dawson, Jamaica, Herndon and Yale.

SCHLESWIG, IOWA.—A municipal light and water system is under consideration here.

WAVERLY, IOWA.—Plans are being made for improvements and extensions to the municipal electric-lighting system.

HUNTSVILLE, MO. — The Moberly (Mo.) Light & Power Company has purchased the local electric-lighting plant owned by C. H. Dameron.

IUKA, KANS.—A transmission line is to be erected from Pratt to Iuka to supply electrical energy for a lighting system in Iuka. The power line is to be built by Iuka, the people here issuing $3,000 in bonds for that purpose.

STOCKTON, KANS.—Plans have been made for improvements to the municipal electric-lighting plant, to be made under the direction of G. P. Taylor, of this city, engineer.

OMAHA, NEB.—The Omaha & Lincoln Railway & Light Company has recently purchased a transmission line extending from Louisville, Neb., to Plattsmouth, Neb.

SHUBERT, NEB.—Bonds in the sum of $6,500 have been voted for the installation of a street-lighting system here. Energy will be secured from the new municipal plant at Stella, Neb.

MAX, S. D.—The Village Board has contracted for the installation of a number of ornamental lighting units.

KILLDEER, N. D.—Construction work has been started on an electric-lighting plant which will be owned and operated by R. S. Davidson, of this city.

DATES AHEAD.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 4-7. Secretary, George C. Holberton, San Francisco, Cal.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. M. Stine, 211 Locust Street, Harrisburg, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Seattle, Wash., September 5-8. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Northwest Electric Light and Power Association. Annual convention, Hotel Washington, Seattle, Wash., September 6-9. Secretary, W. G. Letson, Jim Creek Water, Light & Power Company, Arlington, Wash.

Indiana Electric Light Association. Annual convention, Anthony Hotel, Fort Wayne, Ind., September 12-14. Secretary, Thomas Donohue, Lafayette, Ind.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-20. Assistant secretary, C. D. Fawcett, 29 West Thirty-ninth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

American Electrochemical Society. Semi-annual meeting, New York City, September 28-30. Secretary, J. W. Richards, South Bethlehem, Pa.

Electrical Supply Jobbers Association. Quarterly meeting, Hotel Statler, Cleveland, O., October 10-12. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, N. E. L. A. Annual convention, Pittsfield, Mass., October 17-20. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Telephone Pioneers of America. Annual meeting, Atlanta, Ga., October 19-20. Secretary, R. H. Starrett, 15 Dey Street, New York City.

Jovian Order. Annual convention, Indianapolis, Ind., October 18-20. Secretary, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

MINTO, N. D.—An electric franchise has been awarded to F. J. Lizkowski, who has placed orders for the necessary equipment for a plant.

RAY, N. D.—The Ray Electric Company, which supplies the city with energy for light and power purposes, changed hands when A. H. Myer, of Ortonville, purchased the interests held by Charles Summers and W. C. Tatem. Improvements will be made.

UNDERWOOD, N. D.—The Village Board has granted a 20-year franchise to J. O. Hendricks, who will erect and operate an electric-lighting plant here.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The Louisville Electric Railway is dismantling its storage battery at the old Campbell Street power plant. Before the new High Street power house was placed in service the storage battery was used for peak loads and in emergencies.

WINCHESTER, KY.—It is reported that G. E. Tomlinson, of this city, will purchase a 100-kilowatt, 60-cycle, 220-volt generator and a number of motors of 3 to 30 horsepower.

KNOXVILLE, TENN.—The water commission has recommended the installation of new pumps at the municipal pumping station.

TRIMBLE, TENN.—The city has issued $5,000 in bonds and will establish a municipal lighting plant.

ANDALUSIA, ALA. — The Andalusia Light & Power Company proposes to install a 200-horsepower boiler, 175-kilowatt generator and engine, super-heater and condenser.

TROY, ALA.—The city will install equipment in the municipal electric-lighting plant which will include two 300-horsepower boilers, and a 600 horsepower tandem compound condensing engine direct connected to a 400-kilowatt generator.

PORTLAND, ARK.—E. O. Cummings has been granted a franchise to install and operate an electric-lighting plant here.

FAIRLAND, OKLA.—A new electric-lighting plant has been completed and placed in operation here. The old plant was completely rehabilitated, new machinery being installed throughout. J. D. Smith is manager of the plant.

MIAMI, OKLA.—Bonds in the sum of $25,000 have been voted, the proceeds to be used for the installation of electric-lighting and water plants.

AUSTIN, TEX.—The Trinity Construction Company, of Dallas, has been awarded the contract for making improvements to the electric power plant of the state capitol, to cost $4,230.

SAN ANTONIO, TEX.—The San Antonio Traction Company has placed an order for 30 new steel street cars, costing approximately $120,000.

WESTERN STATES.

GLASGOW, MONT.—The telephone systems of Northwestern Montana, from Havre east as far as Sydney, owned by the Moore Telephone & Telegraph Company, of Glasgow, have been taken over by the recently organized Four Valleys Telephone Company, of Glasgow, which is incorporated at $400,000. The new company will extend its lines at once from Glasgow to Baylor, thence to Glentana and Opheim. R. J. Moore, Glasgow, is president of the Four Valleys company.

TOSTON, MONT.—Right of way for an electric line from Toston to Radersburg has been obtained D. F. Shull. A survey has been made and capital for building and equipping the line has been assured. Work will start this month.

DENVER, COLO.—During the past week the Colorado Power Company has increased its holdings by taking over the United Hydro-Electric Company, which has operated the Gilpin and Clear Creek Counties. In addition to securing power plants at Idaho Springs, Black Hawk, and Georgetown, Colo., the power company acquires several important reservoir sites by the consolidation.

PUEBLO, COLO.—The Arkansas Valley Railway Light & Power Company is building a new 7,500-kilowatt power plant at Canon City. Orders for all the material have been placed.

LORDSBURG, N. M.—The Carlisle Mining Company is preparing to erect an electric power plant either at Duncan or at some point on the San Francisco River, which flows through the company's property.

KINGMAN, ARIZ.—The Burro Creek Hydro-Electric Power Company has secured authority from the Arizona Corporation Commission to proceed with its plans in the Oatman mining district. A large hydroelectric plant will be built and an extensive system of transmission lines erected for the purpose of furnishing power to the mines of this part of Arizona.

MIAMI, ARIZ.—The Miami Consolidated Copper Company is building an electric power plant to cost about $300,000. Three Diesel engines will develop 3,750 horsepower, direct connected to dynamos which are to deliver 2,160 kilowatts. The Inspiration Copper Company, which owns the property adjoining that of the Miami Consolidated Copper Company, obtains part of its power from the hydroelectric plant of the United States Reclamation Service at the Roosevelt dam at a cost of three-fourths of a cent per kilowatt-hour.

TUCSON, ARIZ.—John W. Dailey, of Tucson, and associates have made application to the United States Department of Interior for the permission to build a dam for the storage of water in Sabino Canyon and for the construction of a hydroelectric plant. The plans also involve the building of a system of power transmission lines to Tucson and other points in this section and the piping of water from the proposed reservoir to this city.

CARSON CITY, NEV.—The Douglas Mining & Power Company has commenced work on a new power plant to be built on the Carson River near the town of Gardnerville.

BOISE, IDAHO.—The Utah Power & Light Company has been granted a certificate of public convenience and necessity to provide electric service to the Lava Hot Springs.

EVERETT, WASH.—City Clerk Lesh, in a statement to the City Council, reports that according to the investigations of Robert Howes, consulting engineer of Seattle, retained to investigate the feasi-

bility of installing a municipal lighting plant on the Sultan River, the installation will cost something more than $6,000,000. The report states that 72,500 electrical horsepower can be delivered daily in Everett for a 12-hour period, or 36,250 continuously. As the city of Everett is heavily bonded, it is understood the plant will not be built in its entirety at once but will be constructed one unit at a time. The proposition will be placed before the voters at an early date.

SEATTLE, WASH. — The municipal lighting department will expend approximately $425,000 for improvements and extensions to the local lighting system. The following expenditures are provided for: $10,000 for overhead alterations; $70,000 proposed for underground improvements and extensions, and $275,000 for extensions of overhead lines, etc. In order that the department may make the improvements and extensions contemplated an increase in rates for lighting is being given consideration.

ASHLAND, ORE.—According to reports an arrangement has been made by the Ashland Mining Company and the California-Oregon Power Company whereby the latter company will supply electric energy to the mining company for the operation of its machinery in the local mines and mill. A new millhouse, under construction, is to be equipped with the latest electric equipment.

BAKER, ORE.—According to reports the City Council will shortly place an order for lights and standards for an ornamental lighting system to be installed in the business district of the city. A three-lamp cluster unit will be used, the top lamp being placed in the position usual for the single-unit variety, while the two lights at the side will be detachable.

MYRTLE CREEK, ORE.—An election will be held here on August 26 to vote on a bond issue of $27,000 for the construction of a municipal electric light system, plans for which have been submitted by Engineer M. B. Germond.

PORTLAND, ORE.—The Pacific Telephone & Telegraph Company plans the expenditure of about $50,000 on new construction work in Portland, work to include trenches for underground conduit, two circuits of 435-pound copper wire, and four circuits of 172-pound wire, between Portland and Astoria, also other construction work along this line.

WALLOWA, ORE.—A deal has just been closed by which the Enterprise Electric Company has taken over the Joseph Light & Power Company's plant at Joseph, Oregon. The consideration was $57,500. The former company has been operating in Wallowa, Enterprise and Lostine for the past four years and has supplied energy to all of the towns in the Wallowa Valley with the exception of Joseph. A transmission line will be built at once from Joseph to Enterprise under the supervision of B. L. Sivyer, of Spokane, Wash. The company's headquarters are at Spokane, with W. C. Sivyers president, Adolph Galland vice-president, B. L. Sivyer secretary and treasurer, and L. M. Simpson general manager.

FORT BIDWELL, CAL.—The Board of Supervisors of Lake County has awarded a franchise for furnishing electrical energy for light and power purposes in the town of Fort Bidwell to I. H. Skillmun and W. D. Dill, doing business as the Bidwell Electric Company.

FRESNO, CAL. — The San Joaquin Light & Power Company has bought the necessary material and will soon extend its lines into the northern part of Santa Barbara County. As planned the extensions will reach the towns of Los Alamos, Los Olivos, Santa Ynez, and Solvang.

GRASS VALLEY, CAL.—Tuohy Brothers have been awarded a contract by the Pacific Gas & Electric Company for the raising of Lake Spaulding dam 35 feet. The work is to start immediately.

LAGUNA, CAL.—Plans are under way for the formation of a lighting district to include all the subdivisions of Laguna, with the intention of providing the place with a modern lighting system.

LOS ANGELES, CAL.—The municipality has taken out a permit for the building of an electric substation at a cost of about $50,000 at 1636 St. John Street. Power will be brought into the city to this station at a voltage of 100,000, and will be distributed by 30,000-volt lines.

LOS ANGELES, CAL.—The Pacific Telephone & Telegraph Company has begun preliminary work on approximately 30 miles of aerial cable line and other improvements involving an expenditure of approximately $23,900. The lines will run from this city to Torrance, Inglewood, Long Beach and San Pedro. The cables will carry 25 circuits. The company will also make an extension from Cortez Avenue to Owensmouth at an estimated cost of $30,000, involving 15 miles of new pole line, 30 miles of copper telephone wire and 15 miles of iron exchange wire. Additional equipment for Chula Vista in San Diego County to cost $4,000 in addition to $12,000 already appropriated is also announced.

OAKLAND, CAL.—The Pacific Gas & Electric Company has acquired property at Sixteenth and Clay Streets in this city on which an office building will be erected at a cost of $200,000 for the use of the company's Oakland departments.

SAN FRANCISCO, CAL.—City Engineer O'Shaughnessy has made recommendation for a Hetch Hetchy power plant and transmission lines that will cost about $120,000. This expenditure is necessary, he says, for the generation of electricity to operate the machinery at the various construction camps. It is supposed to develop this power by diverting water from Cherry River, leading it through a canal to a point and dropping it down with a 330-foot head in the Tuolumne River.

New Incorporations

TOLEDO, O.—Scannell Electrical Construction Company. Capital, $10,000. Incorporators: H. C. Scannell and G. L. Mercereau.

ST. LOUIS, MO.—Perfectolyte Company, Capital, $50,000. Manufacture lighting fixtures. Incorporators: Frank Adam, Harry C. Adam and C. J. Bente.

TEMPE, ARIZ.—Darling's Electric Vaporizer Company. Capital, $10,000. Incorporators: L. H. Darling and H. M. Porter, of Los Angeles, Cal.

JERSEY CITY, N. J.—Utility Gas & Oil Company. Capital, $20,000. Incorporators: J. I. Gillespie, of Tulsa, Okla.; William M. Clark and Samuel J. Dill, of New York City.

BRIDGEPORT, CONN.—American Power Company. Capital, $100,000. Incorporators: J. J. Hogan and J. T. Hubbard, of Bridgeport, and J. G. Hoffman, of New York City.

NEW YORK, N. Y.—Lenox Electric Company. Capital, $5,000. Electrical contracting. Incorporators: William Cohen, 100 West 142nd Street; B. Salzman and J. Myers, of Bronx, N. Y.

DOVER, DEL.—Keller Portable Lamp Company. Capital, $50,000. Manufacture electric lamps. Incorporators: Wilson P. Marchbank, Vincent C. King and Thomas Corbett, all of New York City.

NEW YORK, N. Y.—Ameco Motor & Electric Company. Capital, $5,000. Manufacture dynamos and electrical apparatus. Incorporators: M. M. Rafkin, A. Shadur and F. H. Bang, all of 217 Cedar Street.

NEW YORK, N. Y.—Gold Seal Battery & Electric Company. Capital, $10,000. Incorporators: Robert Martin, 1036 Simpson Street, Bronx, N. Y.; Louis Silverman, of Brooklyn, N. Y., and A. Scheiber, of New York City.

ROSWELL, N. M.—Lincoln Light & Power Company. Capital, $150,000. Incorporators: J. H. Fulmer and G. H. Fuller, of Chicago, Ill.; A. T. Graham, of South Bend, Ind., and G. L. Ulrick, of Carrizozo, N. M.

PHILADELPHIA, PA.—G. H. Swanfeld Company. Capital, $25,000. Manufacture electrical and mechanical appliances and fixtures. Incorporators: G. H. Swanfeld and G. C. Swanfeld, of Philadelphia, and J. L. Burbage, of Westmont, N. J.

Financial Notes

For the year ended June 30, 1916, American Light & Traction Company earned 26.88 per cent on the average amount of $17,152,500 common stock outstanding in the year, compared with 23.90 per cent on an average amount of $15,533,320 outstanding in the preceding year.

Empire District Electric Company for year ended June 30 reported gross of $1,437,847, or 63 per cent over the preceding year, with net of $606,212, a gain of 49. In the last five years gross earnings of the company have increased almost 300 per cent and interest on the first mortgage bonds of the company is now being earned 3.25 times.

The California State Railroad Commission has issued an order authorizing the Great Western Power Company to issue first-mortgage five per cent sinking-fund 40-year gold bonds at not less than 90 per cent of the face value plus accrued interest, and to reacquire these bonds at not less than the same price for delivery to the company's trustee under its first-mortgage payment of sinking-fund obligations, due July 1, 1916.

The Reading (Pa.) Transit & Light Company has issued a report showing earnings for June, 1916, of $216,065.80, an increase of $35,016.56 over the corresponding month for 1915. For the 12 months ending June 30, the gross earnings were $2,394,884.68, an increase over the previous 12 months of $222,610.71. The operating expenses for the past year increased $187,895.40, reducing the increase in the operating income of $34,715.31.

Cleveland and New York financial interests are perfecting plans for the consolidation of the electric railway, light and power properties of the Northern Ohio Traction Company and the Republic Railway and Light Company. Controlling interests of the Northern Ohio Traction, it is understood, have given an option on their holdings at $100 a share. The option on the common stock of the Republic Railway and Light is reported having passed at $50 a share.

Pacific Lighting Corporation has declared the regular quarterly dividend of two per cent on its common stock and an extra dividend of one-half of 1 per cent on the common stock and the regular quarterly dividend of 1.25 per cent on its preferred stock, all dividends payable August 15 to stock of record July 31. While the one-half of one per cent was declared as an extra dividend it is the general impression that the same extra dividend will be paid each quarter so long as earnings justify the declaration, thus placing the common stock on a ten-per-cent basis. Pacific Lighting Corporation has $4,800,000 common and $4,162,000 five-per-cent preferred. It owns the entire capital stocks of the Los Angeles Gas & Electric Corporation and derives its principal revenues from this company. Recent adjustment of rate differences in its territory has strengthened the position of the operating company.

Reports of Earnings.

CENTRAL ILLINOIS PUBLIC SERVICE.

Central Illinois Public Service Company, a subsidiary of Middle West Utilities Company, reported earnings for the five months ended May 31 as follows:

	1916	1915
Gross earnings	$840,218	$716,033
Net after taxes	332,157	258,106

For 1916, after financial adjustments now under way have been completed, it is estimated that the company will earn $2,159,752 gross, $910,752 net, $402,842 surplus after interest and discount, and $209,342 after

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug 7	July 31
American Tel. & Tel. (New York)	129½	129¼
Commonwealth Edison (Chicago)	142	....
Edison Electric Illuminating (Boston)	239	....
Electric Storage Battery common (Philadelphia)	65⅝	66⅜
Electric Storage Battery preferred (Philadelphia)	65¾	66⅝
General Electric (New York)	167	169
Kings County Electric (New York)	....	127
Massachusetts Electric common (Boston)	8	8
Massachusetts Electric preferred (Boston)	40	36½
National Carbon common (Chicago)	170	172
National Carbon preferred (Chicago)	121¼	123½
New England Telephone (Boston)	128	134½
Philadelphia Electric (Philadelphia)	28¾	28⅛
Postal Telegraph & Cables common (New York)	....	....
Postal Telegraph & Cables preferred (New York)	....	....
Western Union (New York)	93¼	92⅞
Westinghouse common (New York)	57	57⅞
Westinghouse preferred (New York)	68	....

dividends on the preferred stock, or 2.08 times the requirements for the preferred issue. An adjustment of financial relations with the Middle West Utilities Company has been made, and July 1 the latter company converted $1,500,000 of debentures and notes of Central Illinois Public Service into common stock, these notes and debentures representing cash advances made by the parent company to the subsidiary. Further cash advances by Middle West Utilities outstanding and represented by notes have been made junior to the preferred stock, and December 1 Middle West Utilities Company will deliver to Central Illinois Public Service an additional $500,000 of debentures and take therefrom common stock to the same amount, thus making a total of $2,000,000 of cash paid to the subsidiary company by the parent company represented by an equal amount of securities junior to the preferred stock. All the common stock of Central Illinois Public Service Company is owned or controlled by Middle West Utilities Company.

CUMBERLAND COUNTY POWER & LIGHT COMPANY.

	1916	1915
May gross	$ 223,429	$ 204,545
Net after taxes	86,992	86,744
Surplus after charges	20,767	16,418
Twelve months' gross	2,736,122	2,550,473
Net after taxes	1,125,823	1,109,321
Surplus after charges	331,669	339,540
Balance after preferred dividends	193,669	201,540

DAYTON POWER & LIGHT.

	1916	1915
June gross	$115,735	$76,115
Operating expense	66,177	42,527
Net earnings	49,558	33,588
Non-operating revenue	547	959
Total income	50,105	34,547
Interest on bonds	15,204	15,287
Other interest and sinking fund	4,452	2,721
Total deductions	19,656	18,008
Net income	30,449	16,539
Dividend on preferred stock	14,812	10,543
Surplus	15,637	5,996

KINGS COUNTY ELECTRIC LIGHT & POWER AND BROOKLYN EDISON.

A comparative statement showing the results of the operation of the Kings County Electric Light & Power Company and the Edison Electric Illuminating Company of Brooklyn for the six months ending June 30, 1916, and 1915, is as follows:

	1916	1915
Gross operating revenue	$4,079,456	$3,345,703
Taxes	311,500	240,000
Depreciation	867,077	573,849
Total operating expenses	2,857,247	2,216,242
Net operating revenues	1,222,208	1,129,461
Net non-operating revenues	32,791	29,367
Total net revenue	1,254,999	1,158,828
Income deductions	389,651	432,302
Net income	865,348	726,526
Stock outstanding	15,521,200	13,421,800

UNITED LIGHT & RAILWAYS COMPANY.

Combined earnings of United Light & Railways Company and subsidiaries for the year ended June 30, 1916, were:

	1916	1915
Gross earnings	$6,664,092	$6,144,306
Net after taxes	2,666,768	2,377,239
Surplus after charges	1,270,100	1,031,057

The earnings of United Light & Railways Company for the year from operations of subsidiaries and other sources were:

	1916	1915
Total gross income	$1,831,666	$1,516,779
Expenses	139,110	117,873
Interest charges	547,367	477,585
Discount	5,015	12,912
Preferred dividends	591,052	525,984
Surplus	* 549,110	382,425

*Equivalent to 7.9 per cent on the common stock.

NEW ENGLAND POWER COMPANY.

New England Power Company and subsidiaries, the operating system of the New England Company, reported earnings as follows for June and the six months ended June 30:

	1916	1915
June gross	$ 171,705	$ 117,577
Net after taxes	109,837	64,823
Surplus after charges	58,844	20,057
Balance after preferred dividends	29,371	*6,989
Six months' gross	1,003,720	706,787
Net after taxes	666,709	443,107
Surplus after charges	368,766	209,540
Balance after preferred dividends	203,735	52,098

*Deficit.

Proposals

ELECTRICAL MACHINERY.—Bids will be received until August 15 for the machinery and construction of an electric-lighting and water plant at Assiniboia, Sask., Can. Plans and specifications may be secured from J. R. Nolan, secretary.

ELECTRICALLY DRIVEN PUMP. — Bids will be received by the city purchasing agent of Portland, Ore., until September 1, for one multistage turbine pump, direct connected to a 200-horsepower electric motor. Specifications and further information may be obtained from City Purchasing Agent Wood.

New Publications

NEW ZEALAND TELEGRAPHS. — The annual report of the Post and Telegraph Department for the year 1915 has been issued. It contains financial statements, rates, an account of progress with the installation of the automatic telephone system, etc.

TERRESTIAL MAGNETISM. — The United States Coast and Geodetic Survey has issued "Results of Magnetic Observations Made by the United States Coast and Geodetic Survey in 1915," by Daniel L. Hazard. This gives tabulated results and a description of stations, with secular changes, etc. The results of observations in Porto Rico in 1913 and 1914 have also been published, in Serial No. 33.

WATER RESOURCES.—The Canadian Department of the Interior has published "Winnipeg River Power and Storage Investigations," by J. T. Johnston, in two volumes. The first volume contains 511 pages of test tables, maps and diagrams, while the second volume contains 56 topographic sheets. The investigations show nine sites on the Winnipeg River where 418,000 total horsepower could be continuously developed. Three of these are already occupied. Copies of the report can be obtained free of charge from the Superintendent of the Dominion Water Power Branch, Ottawa, Canada.

Electrical Patents Issued August 1, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,192,839. Gasolene Gun. A. O. Armour, Dalton, Ga. Electrically ignited.

1,192,844. Meter-Testing Block. H. J. Blakeslee, Hartford, Conn. Arrangement of conductors and binding posts.

1,192,852. Means for Automatically Filling Containers. L. K. Bruton, Racine, Wis. Feed of material electrically controlled.

1,192,856. Electrically Operated Door. I. L. Cain, San Angelo, Tex. Door opened and held open by electromagnetically controlled latch.

1,192,857. Air Distributer. S. Caldwell, Live Oak, Fla., and C. J. Williams, Atlanta, Ga. For attachment to electric fan.

1,192,863. Electric Gas-Lighter. W. G. Chapman, Huntington, W. Va., assignor of one-half to T. J. Feugate, Huntington, W. Va. Hand tool with electrodes for producing lighting spark.

1,192,876. Spot-Light. R. W. Ebeling, Oakland, Cal. Relative control of pair of electric projectors.

1,192,879. Thermo Cutout. D. Ferrell, Carterville, Ill. Fuse in supply circuit submerged in transformer oil.

1,192,885. Direction-Indicating Apparatus for Motor Vehicles. W. J. Garvey, Buffalo, N. Y. Electromagnetically operated.

1,192,887. Contact for Internal-Combustion Engine Igniters. J. E. Gilson, assignor to Gilson Mfg. Co., Port Washington, Wis. Has reversible contact-plug.

1,192,895. Ticket-Vending Machine. A. W. Hills, assignor to Caille Bros. Co., Detroit, Mich. Electric-motor operated.

1,192,906. Current-Interrupter. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. For ignition circuits.

1,192,909. Spark-Gap. F. H. Kroger, assignor to S. M. Kintner and H. M. Parrett, receivers National Electric Signaling Co., Pittsburgh, Pa. Special form of quenched gap.

1,192,911. Composite Resistance. M. E. Leeds, assignor to Leeds & Northern Co., Philadelphia, Pa. Has constant temperature coefficient.

1,192,933. Railway Signal System. A. W. Reinhardt, Bethel, O. Structure and mounting of contact shoes.

1,192,951. Automobile Signalling Apparatus. C. R. Taggart, Chattanooga, Tenn. Electromagnetically controlled and illuminated pointer mounted on radiator.

1,192,961. Fluid-Pressure Brake Device. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Particular electrically controlled valve devices.

1,192,964. Oscillating-Current Transformer. R. A. Weagant, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J., receivers. Has revoluble two-part primary eccentrically mounted inside secondary.

1,192,974. Automatic Fuse Cutout. C. S. Anderson, Ripon, Cal. Blowing of fuse releases catch holding switch open.

1,192,975. Telephone Set. C. S. Baker, Philadelphia, Pa. Structural details of desk set.

1,192,982. Sign Construction. F. A. Bristol and P. J. Scharringhausen, assignors to Bristol Mfg. Co., Chicago, Ill. Mounting of lamps in sign letters.

1,192,993. Automatic Telephone and Responding Apparatus. E. J. Cressey, Wichita, Kans. Comprises phonographic sound-transmitting apparatus.

1,193,012. Motor-Driven Clock. G. A. Goodson, New York, N. Y. Electrically-driven and controlled.

1,193,018. Electric Bath. M. Howard, Ft. Worth, Tex. Attachment for tub to pass current through water.

1,193,025. Attaching Device for Lamp Sockets. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. In usual screw-threaded connection of socket cap, a ring contracts cap bushing.

1,193,031. Portable Flash-Lamp. H. E. Leininger, Chicago, Ill. Lamp may be moved to one side to overhang book.

1,193,036. Electromagnetic Valve. J. F. McElroy, assignor to Consolidated Car Heating Co., Albany, N. Y. Comprises operating electromagnet.

1,193,053. Machine Telephone System. L. Polinkowsky, assignor to Western Electric Co., New York, N. Y. Special arrangement of sequence switches in automatic system.

1,193,075. Spark-Plug and Method of Forming Same. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Details.

1,193,076. Electrical Connection. L. Schon, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Field regulation of dynamo.

1,193,081. Latch Mechanism for Bulletin Printing Machines. K. A. A. Staahlgren, assignor to National Electric Bulletin Corp., New York, N. Y. For telegraph printers.

1,193,083. Railway Signaling. P. H. Thomas, assignor to Union Switch & Signal Co., Swissvale, Pa. Block system having signaling and propulsion currents of different frequencies.

1,193,095 and 1,193,096. Electrical Measuring Instrument. H. C. Wert, Mt. Vernon, N. Y., assignor of one-fourth to D. M. Benford and one-half to Sarah B. Benford, Mt. Vernon, N. Y. First patent: Indicator actuated by solenoid plunger against gravity. Second patent: Indicator for charge, discharge and condition of storage battery.

1,193,102. Signal Lamp for Street Cars and Trains. C. A. Winebrenner, Akron, O. Adjustable lamp-mounting.

1,193,105. Motor Drive. J. J. Wood, assignor to General Electric Co., Schenectady, N. Y. For sewing machines.

1,193,121. Electric Knife-Heater. E. N. Chandler, Braintree, Mass. Adapted to receive a number of blades.

1,193,122. Automatic Train-Stopping Device. G. H. Clark, Paris, Me. Valve in train-line pipe controlled by magnetism of magnet about track.

1,193,137. Call-Registering System for Automatic Telephone Systems. C. L. Goodrum, assignor to Western Electric Co.

Meters connected to test contacts of finder switches.

1,193,138. Electrical Display Means. LeR. A. Hanson, assignor of one-third to F. Adsit and one-third to R. E. E. Hanson, all of Chicago, Ill. Gives effect of movement of colored characters across sign.

1,193,143. Apparatus for Sterilizing Liquids by Means of Ultra-Violet Rays. Special structure of liquid passage.

1,193,159. Electric Time-Switch. J. H. Lamb, Washington, Ind. Clock controlled.

1,193,160. Automatic Telephone Trunking System. W. E. Lamb, assignor to Automatic Electric Co., Chicago, Ill. Circuit arrangements including non-numerical trunking switch.

1,193,168. Electric Prod Pole. R. E. Martin, Mason, Tex. Has electrodes at end for application to animal.

1,193,169. Measured-Service Telephone System. T. G. Martin, assignor to Automatic Electric Co. Meters operated by current actuating the automatic switches.

1,193,179. Telephone-Call Register and System. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. For automatic systems.

1,193,184. Telephone Transmitter. A. Plecher, Las Animas, Colo. Variable microphonic resistance comprises membrane having conducting film engaged by numerous contact points.

1,193,185. Machine for Internally Shaping Telegraph Insulators and the Like. W. Podmore, Porthill, Stoke-upon-Trent, assignor of one-half to H. L. Doulton, London, Eng. For forming insulators for clay planks.

1,193,191. Lamp Shade. H. K. Ritter, Niagara Falls, Ontario, Can. Distributor and reflector for incandescent lamp.

1,193,205. Electric Starting and Lighting System. C. Tichenor, assignor to Gray & Davis, Inc., Boston, Mass. For automobiles.

1,193,206. Thermionic Amplifier and Rectifier. H. J. van der Bijl, assignor to Western Electric Co. Of the audion type.

1,193,209. Apparatus for Sterilization of Fluids by Ultra-Violet Rays. M. von Recklinghausen, assignor to R. U. V. Co., Inc., New York, N. Y. Apparatus for manipulating liquid controlled by current in lamp.

1,193,211. Railway Car. G. Webster, assignor to Barber Car Co., York, Pa. Mounting of engine and dynamos set for driving propelling motor.

1,193,217. Printing-Telegraph System. C. G. Ashley, assignor to General Engineering & Construction Co., Ltd., Toronto, Can. Has means for storing impulses and discharging them through printing electromagnets.

1,193,218. Printing-Telegraph Receiver. C. G. Ashley, assignor to General Engineering & Construction Co., Ltd. Electromagnetic pen-operating apparatus.

1,193,226. Dynamo Support. W. L. Bliss, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. For dynamo belt-driven from car axle.

1,193,227. Generator Suspension. W. L. Bliss, assignor to U. S. Light & Heat Corp. Modification of above.

1,193,239. Electric Switch. F. B. Cook, assignor to F. B. Cook Co., Chicago, Ill. Spring-jack structure.

1,193,252. Self-Locking Sign Receptacle. E. H. Freeman, assignor to E. H. Freeman Electric Co., Trenton, N. J. Comprises two members having pawl and ratchet connection.

1,193,253. Switch Block and Casing. A. I. Fromager and J. F. Six, Montreal, Can. Details of sliding plug switch with fuse plugs.

1,193,258. Speed Control for Turret Lathes and the Like. H. B. L. Gorman, assignor to Gisholt Machine Co., Madison, Wis. Electromagnetic control of motor-field resistance.

1,193,270. Magneto-Generator. P. Van S. Kolff, assignor to Electric Tachometer Corp., Philadelphia, Pa. Has means for adjusting field poles with relation to the armature.

1,193,271. Heating and Ventilating System. F. A. Kuntz, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Electromagnetic control of damper for stove, and blower for heated air.

1,193,285. Egg Holder and Candler. L. E. Miller, Neodsha, J. M. Miller, Salina, and A. L. Carlton Bird City, Kans. Egg frame with movable lamp to successively view eggs.

1,193,293. Time-Switch. R. C. Patton, assignor to D. & W. Fuse Co., Providence, R. I. Two-push-button flush switch.

1,193,312. Draw Bar for Railroad Cars. G. P. Thurber, assignor to Automatic Train Control & Signal Co., Pittsburgh, Pa. Insulated coupling.

1,193,316. Illuminated Advertising Apparatus. Rotary advertising cylinder internally illuminated.

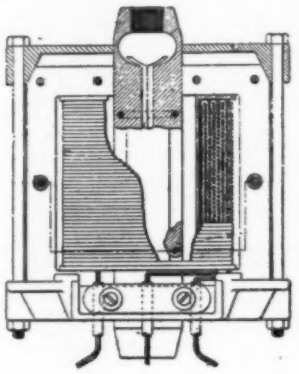
1,193,349. Dynamoelectric Machine. W. L. Bliss, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. Shiftable brush mechanism.

1,193,358. Electrical Terminal Connection. C. C. Carpenter, assignor to U. S. Light and Heat Corp. For storage batteries.

1,193,379. Automobile Signal. E. T. Gray and A. T. Hoevet, New York, N. Y. Switchboard and connections for selectively controlling lamps.

1,193,380. Electric Switch. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Rotary snap switch has several superposed sets of contacts.

1,193,381. Regulating Device for Hydraulic Power Plants. E. Hagenbucher, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Circuit for driving motor of pump controlled by float in accumulator.



No. 1,193,404.—Induction Heater.

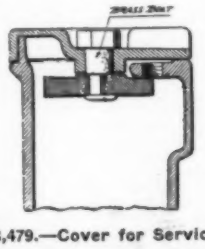
1,193,396. Headlight. H. E. Kent, Dorchester, Mass. Has papier mache body.

1,193,404. Induction Heater. W. D. Ludwick, assignor to Electric Heating Co., Tacoma, Wash. Core having recess for material is surface chilled to increase coercive force, is surrounded by coil and magnetic circuit completed by limbs of less resistance. (See cut.)

1,193,438. Automobile Lamp. A. G. Smith, Hempstead, N. Y. Arrangement of reflector and casing of headlight.

1,193,445. Electric Water Heating Faucet. E. C. Webster, East Oakland, Cal. Water flows directly from pipe to spout or diverted through heater at will.

1,193,447. Trolley. C. J. Wells, assignor of one-third to S. L. Deland, both of Long Beach, Cal. Pole in two sections with tip section spring pressed upwardly.



No. 1,193,479.—Cover for Service Boxes.

1,193,458. Measured-Service Telephone System. E. D. Fales, assignor to First Trust & Savings Bank, trustee, Chicago, Ill. For automatic systems.

1,193,467. Apparatus for Cooling Heated Air by Electric Currents. A. L. Mills, New York, N. Y. Junctions of thermocouples in air conduit.

1,193,471. System for Automatic Control of Railway Trains. B. C. Rowell, Lilla C. Rowell, executrix, Chicago, Ill. Block system with signals and train stops.

1,193,471. Mechanism for Operating Brakes in Signal Systems. B. C. Rowell, Lilla C. Rowell, executrix. For use in above.

1,193,479. Cover for Service Boxes. O. G. Hitchcock, assignor to Hays Mfg. Co., Erie, Pa. Special cam and lug securing means. (See cut.)

1,193,485. Converter. A. T. Kasley, Swissvale, Pa. Current transformer reducing frequency in utilization circuit and causing current and voltage values to approximate the sine curve.

1,193,489. Motor Drive. A. F. Welch, assignor to General Electric Co. Motor and brake arrangements for sewing machines.

1,193,490. Motor Drive. J. J. Wood, assignor to General Electric Co. Modification of 1,193,489.

1,193,492. Train-Controlling Apparatus. B. B. Breeden, assignor of one-half to C. Lawson, one-fourth to W. L. Vaughn and Hazel Vaughn, all of Indianapolis, Ind. Has remotely controlled signals and track obstacles.

PATENTS EXPIRED.

The following United States electrical patents expired Aug. 8, 1916:

630,318. Arc-Rupturing Device. E. J. Berg, Schenectady, N. Y.

630,330 and 630,331. Motor Controller for Printing Presses. H. H. Cutler, Chicago, Ill.

630,333. Diphase Electric Motors. S. W. Dietrich, Terre Haute, Ind.

630,345. Automatic Fire-Alarm System. G. C. Hale, Kansas City, Mo.

630,356. Motor Truck. T. J. Johnston and A. H. Abell, Schenectady, N. Y.

630,406. Radiographic Apparatus. S. W. Puffer, Rochester, N. Y.

630,409. Dynamo-electric Machine. H. G. Reist, Schenectady, N. Y.

630,418. Method of and Means for Inducing Magnetism in Magnetic Circuits. C. P. Steinmetz, Yonkers, N. Y.

630,419. Alternating-Current Motor. C. P. Steinmetz, Schenectady, N. Y.

630,448. Electromagnetic Reciprocating Engine. M. S. Conly, Los Angeles, Cal.

630,466. Automatic Rheostat. J. H. McGurty, Jersey City, N. J.

630,470. Electric Arc-Lamp. A. Stuttmann, Russelheim, Germany.

630,475. Electric Headlight Lamp. H. P. Wellman, Ashland, Ky.

630,489. Alternating-Current Motor. M. Deri, Vienna, Austria-Hungary.

630,490. Dynamo-electric Machine and Method of Operating Same. M. Deri, Vienna, Austria-Hungary.

630,491. Combined Alternating and Continuous-Current System of Distribution. M. Deri, Vienna, Austria-Hungary.

630,492. Arrangement for Exciting Magnets of Dynamo-electric Machines. M. Deri, Vienna, Austria-Hungary.

630,501. Metallic Conduit for Electric Wires. E. T. Greenfield, New York, N. Y.

630,513. Electric Arc-Lamp. C. E. Morris, Chester, Pa.

630,539. Automatic Circuit-Breaker. E. M. Hewlett, Schenectady, N. Y.

630,567. Electrically Driven Spindle. H. B. Sawyer, Newton and R. Robb, Concord, Mass.

630,568. Dynamo. H. B. Schneider, Chicago, Ill.

630,598. Electromechanical Perforating Machine. G. H. Davis, New York, N. Y.

630,612. Process of Producing Chromic Acid by Electrolysis. M. Le Blanc, Frankfort-on-the-Main, and H. Reisenegger, Hochst-on-the-Main, Germany.

630,618. Automatic Regulator for Electric Motors. A. T. Marshall, Brockton, Mass.

630,624. Gas-Engine Igniter. C. H. Morse, Jr., Chicago, Ill., and F. G. Hobart, Beloit, Wis.

630,634, 630,635, 630,636 and 630,637. Protective Casing for Electric Cables or Wires. A. Sundh, Yonkers, N. Y.

630,667. Electric Switch. H. H. Curtis, Springfield, Mass.

630,671. Electric Thermostat. L. H. Des Isles, Boston, Mass.

630,690. Process of Manufacturing Metallic Carbides. H. L. Hartenstein, Bellaire, O.

630,697. Electrical Conducting Main. J. S. Highfield, St. Helens, and J. M. Cater, London, England.

630,714. Storage Battery. C. W. Kennedy, Rutledge, Pa.

630,720. Storage Battery. C. Lindenberger, H. Lindenberger and W. B. Teal, Hannibal, Mo.

630,753. Storage Battery. W. H. Smith, London, England.

630,780. Overhead Trolley. H. C. Loudermilch, Enders, Pa.

630,796. Method of Preparing Cathodes for Electrodeposition of Metals. H. Becker, Paris, France.

630,797. Telephone. H. F. Blackwell, Jr., and M. A. Blackwell, New York, N. Y.

630,814. Automatic Electrical Gas-Lighting Device. S. M. Meyer, New York, N. Y.

630,827. Printing Telegraph. F. Hachman, Whitefish Bay, Wis.

Designs 31,366, 31,367 and 31,368. Battery Plate. H. C. Porter, Chicago, Ill.

Design 31,369. Frame for Electric-Fan Motors. R. Lundell, New York, N. Y.

Design 31,373. Rail Bond. W. B. Cleveland, Cleveland, O.